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A NEW THEORY OF ACUTE and SLOW Continu'd FEVERS;

WHEREIN,

Beſides their Appearances and Manner of Cure, occaſionally, the Structure of the *Glands*, and the Manner and Laws of *Secretion*, the Operation of *Purgative*, *Vomitive*, and *Mercurial Medicines*, are Mechanically Explain'd.

TOGETHER

With an Application of the ſame Theory to HECTICK FEVERS:

AND

An ESSAY Concerning the Improvements of the THEORY of MEDICINE.

The Second Edition, with many Additions.

——————*Si propius ſtes*
Te capiet magis. ———Horat. De Arte Poet.

LONDON, Printed for *George Strahan*, at the
Golden-Ball, in *Cornhil*; in the Year, 1702.

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THE

PREFACE.

TO *write any thing tolerable about* Fevers, *or any thing worſe than what has already been advanced by ſome one or other on the Head, is perhaps no eaſie matter : The Ridiculous manner of accounting for their Cauſes and Symptoms, uſed by ſome Pretenders to* Medicine *and* Philoſophy, *has perhaps contributed (in it's way) to that contempt, to which (with ſuch Expence of* Satyr *and* Wit *) they and their Art have been expos'd.*

I have not the Arrogance to think the few following Sheets, will conduce *any thing to wipe it off;But of this I'm ſure, if this* Theory *prove Falſe, the choices behind are fewer by one, and that too by one, of the true Kind, which endeavours to account for their Appearances from* Mechanick *Principles.*

The Wiſer part of Mankind are now perſwaded, That this Machine We carry about is nothing but an Infinity of Branching and Winding Canals, fill'd with Liquors of different Natures, and I am mightily out in my Conjectures, if for the Future any be hear'd about Theories of Diſeaſes, *or the manner of the Operation of Medicines, who do not reaſon from theſe* Data,*&* *their neceſſary Conſequences. And ſeing* Continu'd Fevers *are only a Complication of Symptoms which naturally follow upon a general Obſtruction of theſe Canals (or the*Glands *which they conſtitute) and the neceſſary Effects thereof, as I reckon;*

none, I hope, will be angry I have call'd ſuch a manner of Accounting for them New, ſeing for any thing I know (as to the main thereof) it is really ſo.

For the ſtructure of the Glands, *and the buſineſs of* Secretion, *the Found is* Bellini's, *but I hope it has loſt nothing in my hands. I have added ſomethings, extended others, and made all plain & conſequential.*

As to the other things here occaſionally explain'd (which adding what Bellini *has adduc'd about* Blood Letting) *make up the great and principal Operations, perform'd by Medicines on Animal Bodies) I have very frankly borrowed what of them I found for my purpoſe, from* Borelli, *the foreſaid* Bellini, *and another* Gentleman *whom I reckon the Ornament of his Profeſſion and Our Countrey. But for the moſt part, pointing at Place and Perſon. And I ſhall reckon my ſelf no more a* Plagiary *for this, than*

than a Lawyer is to be accounted one for quoting his Code *or* Pandects.

The occaſion of entering upon theſe thoughts, was the noiſe and buſtle has been made among us about Vomiting in Fevers, about a Year ago: I Endeavour'd to ſatisfie my ſelf ſo as you may ſee, and had the Vanity to think there might be ſome as great Fools as I, If I be miſtaken it's not the firſt time.

I have not been over nice in rangeing the Particulars here contain'd, thoſe who read the whole will ſee their dependence, and for others I was not at the pains to lay in.

The Language is juſt what moſt eaſily dropt from my Pen at firſt writing, the Roughneſs of ſome terms of Art I cou'd not avoid, and the purity of the Engliſh *Tongue is neither the growth of our Country, nor of my occaſions, if it be intelligible it is all (and perhaps ſome may ſay more than) I deſign'd.*

I neither expect nor deſire any reputation from theſe Papers, for I ſufficiently know how few ſuch things oblige. Beſides I'm dreadfully afraid few will Read them, and not over many underſtand them, for want of the neceſſary Qualifications of a moderate attention and a ſmatering of the Mathematicks. The firſt is abſolutely neceſſary, but for the latter they may e'en have a ſtrong Faith, tho' both for them and me I cou'd wiſh it were joyn'd with knowledge.

As for Cenſure, I am in no great dread of it; For I ſhall ly Secure (becauſe conceal'd) and ſee it's adverſaries (if it have the honour to provoke any) ſhoot a rover: If any ſhall take the pains to confute what I have here advanc'd, he may do it very ſafely for his humble ſervant, If he bungle it he'll do me an honour, by ſhewing is is not ſuch as ev'ry Body is able to diſprove: If he do it to purpoſe *he'll do me a kindneſs, by freeing me from my errors. I deſign for the future to medle no more with it, than if it had dropt from the Clouds.*

In fine, all my preſent concern is for the Book-Seller; If he ben't a loſer, (which misfortune wou'd be the moſt effectual confutation) it is indifferent to me, whether it periſh by a particular or the general conflagration.

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I have here mark'd only the Errata which will mar the Senſe, begging the Reader to amend them with his Pen e're he begin the Book: For I hope theſe of miſ-pointing or miſ-ſpeling will ſtop none

Page 9. Line 3. for $a-b$ $13\frac{1}{3}$ Read $a-b=13\frac{1}{3}$ P. 18. L. 19. *for* their, *read* theſe; P. 23, L. 19. *for* Senſible Perſpirations, *read* Senſible Evacuations; Page 24, L. 16. *for* Quantity, *read* Quality; P. 34. L. 2 & 3. *for* Theſe then, what, *read* theſe then, with what; *Ibid.* Line 9, *dele* occaſion'd by Intemperance; P. 40. L. 7 & 8. *for* as the Celerities reciprocally, and the Orifices directly, *read* as the Celerities and the Orifices conjunctly. Page 42. L. 4. *dele* be. P. 81. L. 21. *dele* the. Page 65. *L.* 10. *for* 900000 *read* 90000. P. 96. L. *penult*, for *is* read *are*.

A NEW THEORY OF *Continued* FEVERS.

POSTULATA.

1. THAT the whole Body is nothing but a Congeries of Canals, the greateſt (at leaſt a conſiderable) part of which is *Glands* properly ſo called, deſign'd for the ſeparation of ſome Fluid.

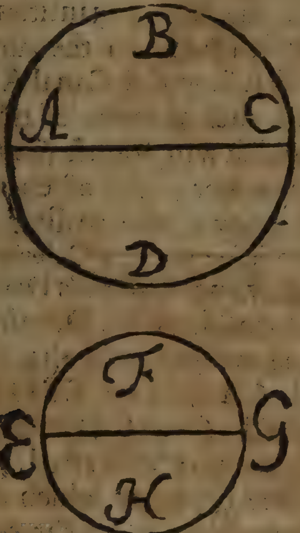
This is evident, when any part of the Body is Swell'd, ſo that the inconſpicuous ones become Viſible; and has been clearly demonſtrated by *Malpigius*, *Leuvenhoeck* and others.

2. That when a Machine is diſordered, if we ſhould ſee it righted by adjuſting ſuch a particular Part, we might without ſcruple affirm, that it was ſome injury done to that part, which had diſorder'd the Machine; eſpecially, if after the whole was taken to Peices, we ſhould find them all ſound, ſave that particular one.

Thus, if we ſhould ſee a Watchmaker, by adjuſting only the Ballance of a Watch, make her go right: we might ſay the diſtortiou of the Axe thereof had occaſion'd her going wrong; eſpecially, if all the other parts be found as they ſhould be.

LEMMA 1.

LEt there be a greater Diſtractile Cylindrical Canal, whoſe Orifice is A B C D, through which a giv'n quantity of Liquor paſſes in a giv'n time; and a leſſer one E F G H,



through which a proportional Quantity of the ſame Liquor paſſes with the ſame Celerity as in the former: Let now the greater A B C D be encreaſ'd or diminiſh'd by the leſſer E F G H, So, as that in the encreaſ'd or diminiſh'd Cylindrical Canals, the ſame Quantities only paſs, which paſſ'd in the ſame time in the firſt ſuppoſed Canal ABCD: To find the quantity of the ſame Fluid which will diſtract (and produce the other effects of encreaſing the quantity of the paſſing Fluid, and conſequently it's Celerity) the Canal (by encreaſing it's Diameter) firſt ſuppoſ'd, A B C D, after the the ſame manner, only that the encreaſ'd (A B C D + E F G H) or diminiſh'd (A B C D − E F G H Canals are now diſtracted.

Let the Quantity which in the firſt Suppoſition paſſes through the Canal ABCD be call'd *a*, and the Quantity which paſſes through the Canal E F G H be call'd *b*: Since in the firſt ſuppoſition the celerities are the ſame in both, their Orifices will be as a and b reſpectively. Likewiſe the encreaſ'd and diminiſh'd Canals (ſeeing their Altitude is ſuppos'd the ſame) will be as their Orifices $a+b$, and $a-b$; and the Quantities paſſing through them in the ſame time, with the ſame celerity, would be likewiſe as $a+b$ and $a-b$: But (in the ſecond Suppoſition) the ſame quantity is ſuppoſ'd to paſs in the encreaſ'd Canal ($a+b$) and diminiſh'd one ($a-b$) which paſſ'd in the firſt ſuppoſ'd Canal ABCD, or a; therefore now the quantieys paſſing through the Canals, encreaſed or diminiſhed, will be as a: wherefore, as $a \pm b$, (the Quantity paſſing through the encreaſ'd or diminiſh'd Canals in the firſt ſuppoſition) is to a; (the quantity paſſing through them in the ſecond ſuppoſition) ſo is b, (the quantity paſſing through the leſſer Canal

EFGH in the firſt ſuppoſition) to $\frac{ab}{a \pm b}$, the Proportional Quantity which paſſes through and will diſtract the leſſer Canal E F G H, after the ſame manner that the encreaſ'd or diminiſh'd Canals are diſtracted in the ſecond Poſition. Adding or Subſtracting this quantity from a, (which as the quantity paſſing through or diſtracting the encreaſ'd or diminiſh'd Canals) the Sum or difference $a \pm \frac{ab}{a \pm b} = \frac{a^2}{a \pm b}$ will be as the quantity which will diſtract the Firſt ſuppoſ'd Canal ABCD after the ſame manner, *&c. q. e. i.*

SCHOLIUM.

THe whole Canals of the Body (ſave the Inteſtines & Lacteals) may be conſidered as a concave *Cylinder*, whoſe Baſe is the Orifice of the Aorta at it's exit from the heart; and whoſe length is a mean Arithmetick Proportional betwixt the longeſt and ſhorteſt Artery (I mean the whole length of the Artery till it degenarat into a Vein; for the length of the Veins are of no conſideration here) It being their ſplitting into Branches which makes them not Cylindrical. Now, by *Poſtul* 1. the Veſſels which make up the *Glands* may have any proportion of minority to the whole of the Canals; ſuppoſing then an Obſtruction or dilatation of the *Glandular* Veſſels, it's evident the foreſaid concave Cylinder will be thereby diminiſh'd or encreaſ'd in any given Proportion: Suppoſe, *e. g.* the diameter of the Cylinder ſo Obſtructed is to that of the whole as 1 is to the $\sqrt{2}$; their Orifices will be as 1 to 2. Suppoſe again, there are twenty pounds of Blood in a Man, ſeeing at the Beginning of the Arterial Veſſels (which conſtitute the Glands) the Velocity is near the ſame, as proceeding from the ſame cauſe, the compreſſion of the Heart. Therefore divide 20 into two parts, which may be (in this caſe) as 1 is to 2. (which done by this general rule $x = \frac{md}{m+n}$, $y = \frac{nd}{m+n}$ puting d for the 20 pounds, x for the greater, and y for the leſſer proportional Part, m to n their *Ratio*) The Parts will be here $6\frac{2}{3}$ and $13\frac{1}{3}$; which are the proportional parts of 20 pounds of Blood, which would naturaly paſs in the obſtruct-Canal, and in the Remainder thereof which is paſſable. But if all the 20 pounds muſt now paſs in the paſſable Canals, then it ſhall be diſtracted as much as if the whole Canals were paſſable; but that 30 pounds of Blood were forced through it in the ſame time, by the preceeding Lemma. For in this caſe $a = 20$, $b = 6\frac{2}{3}$, $a - b$ $13\frac{1}{3}$: and therefore $\frac{aa}{a-b} = 30$. If the Orifices were as 1 to 3, then $b = 5$, $a - b = 15$ and $\frac{aa}{a-b} = 26\frac{1}{3}$ this ſupoſing an obſtruction. If there be a dilatation ſuppoſ'd in the ſame Proportions, then $\frac{aa}{a+b}$ will be in the firſt caſe 15, in the ſecond 16. The ſame may be applyed to the *Liquidum Nervoum*, which paſſes in the Nervous Canals: For the *Gland* conſiſts of a complicated *Nerve* as well as *Artery*, and in an obſtruction or dilatation of the ſame, both *Artery* and *Nerve* are ſuppoſ'd to be obſtructed or dilated.

The deſign of all this is to ſhow that in an Obſtruction or Dilatation of the Veſſels, it is the ſame thing as if the Liquors therein contained were augmented or diminiſh'd in a certain Proportion: as in the caſe of the Blood-veſſels, ſuppoſing 20 pounds of Blood (which is the ordinary Quantity) in a Man; and ſuppoſing one half of the whole (by an Obſtruction in any place of the ſaid) Veſſels were rendred impaſſabe, it is the ſame thing *quam proxime*, as if the whole Blood Veſſels were Paſſable, but that one half more of Blood were forced through them in the ſame time, in which the 20 pounds paſſed. Of the ſame nature is

LEMMA 2.

THe Blood being ſo corrupted, that the ſtrength is impard or encreaſ'd, it is the ſame thing as if it were in it's natural eſtate, but that the quantity thereof were diminiſh'd or encreaſ'd in ſuch a Proportion as is neceſſary for producing this encreaſe or decreaſe of ſtrength.

This is 49*th* Prop: of *Bellini*'s Book *de Motu Cordis* &c. and it's Converſe; The Propoſition it ſelf is there demonſtrated, and it's Converſe may be demonſtrated after the ſame manner exactly.

What is here ſaid of encreaſing or diminiſhing the ſtrength, is likewiſe true of all the neceſſary effects of leſſening or encreaſing the quantity of the Blood. Theſe things premiſ'd, I come to

The General Propoſition.

THE General and moſt effectual cauſe of all Fevers, is the Obſtruction or Dilatation of (the complicated *Nerve* and *Artery*, *the excretory Duct & conſervatory*, one, or rather all theſe; which, as ſhall be afterward ſhewn make up) the *Glands*, and they receive heir denomination as theſe or thoſe *Glands* are more or leſs Obſtructed or Dilated.

Other things may concur, but theſe are the moſt powerfull cauſes.

It were a work of more time aud pains than I can at preſent beſtow, to apply this Propoſition to all particular kinds of *Fevers*; tho' I am ſufficiently ſatisfied it will account for All. I ſhall here only (as an earneſt of the reſt) ſhow how to apply it to continu'd *Fevers*, and therefore contract the General into

THE
Particular Propoſition.

THE moſt effectual Cauſe of continu'd *Fevers* is an obſtrution of the *Glands*, which will neceſſarily augment the Quantity of the Blood and *Liquidum Nervo-*

vorum, in the paſſable Canals & perhaps (by the Stagnation of the Fluids contain'd in theſe) ſo vitiate their nature as that they may be Juſtly reck'ned to concur as a partial cauſe of theſe *Fevers*: But I rely moſt on the Firſt, to wit, the augmentation of theſe Fluids. For a Demonſtration of this, I ſhall Firſt ſhew how it accounts for all the appearances of ſuch *Fevers*, and then ſubjoyn ſeveral Arguments to confirm the ſame.

Suppoſing the *Glands* Obſtructed, the Quantity of the Blood in the *Arterys*, and the *Liquidum Nervorum* in the *Nerves*, may thereby be ſuppoſ'd augmented in any given proportion of minority to the whole maſs of theſe Liquors, *per Lemma* 1. and it's *Scholium*. Wherefore it will hence follow,

§. 1. That the Pulſes muſt be ſtronger and more frequent than ordinary, upon theſe accounts. 1. Seing there is a greater Quantity (than ordinary) of Blood in the *Arterys*, the Lateral Preſſion will be ſtronger; and ſeeing the *Arterys* are diſtractile, they will be driven outward with greater force, and make a ſtronger *Ictus* upon any thing apply'd to them. 2. Seing the Quantity of the Blood is augmented, *i.e.* the Quantity of the matter whence the *Liquidum Nervorum* is generated, there muſt be a greater plenty thereof (*per poſter: part. Lemm:* 2.) generated, and conſequently it will flow more plentifully and more quickly into the heart, and make it contract oftener and more violently. 3 By the obſtruction of the *Gland*, the influence of the *Liquidum Nervorum* thereinto is likewiſe obſtructed; and therefore, *per Lemm*: 1. there will be a greater *Quantity* thereof left to flow in the paſsable *Nerves*, and it muſt flow *qua data porta.* 4. Laſtly, the *Arterys* on every ſide running upon and touching the *Medullar* ſubſtance and *Fibres* of the Brain, will (they being more than ordinarly diſtended) preſs them more than ordinarly and make a more powerfull and plentifull derivation of the *Liquidum Nervorum* into the places whither it can flow.

§ 2. From the ſame cauſe the inequality or Interuption of the Pulſes is evident : For if the fore ſaid Preſsion upon the *Nervous Fibres* of the *Brain* be ſo ſtrong, that it either partly or *totally* occludes the paſſage of the *Liquidum Nervorum* ; there muſt be a ſtop in the derivation, till there be ſuch a Quantity thereof collected, as ſhall be ſufficient to over-power the *Impedimentum* occaſioned by this Preſsion: and ſo make ane inequality or ſtop in the contraction of the Heart. Moreover when the Blood flows in ſuch plenty and with ſuch violence from the *Auricles* into the *Ventricles* of the Heart, it may force it's way before the *Ventricle* be inti'rely Contracted, and thereby cauſe an irregularity in the Pulſe. Add to theſe, what may proceed from the thickneſs of the Blood (it being contracted into a leſs ſpace) and evaporation of it's Humidity. All theſe, either ſingly or compounded, will account for the irregularitys of the Pulſes which have hitherto been obſerved.

§. 5. Great pains in the Head moſt enſue from the violent Diſtractions of the tender Veſſels of the *Brain*, and from the great preſſure of the extended *Arterys* upon the *Fibres* and *Membranes* thereof; all the Canals of every kind being Bowld'ned with their Reſpective

Liquors; and that being the moſt ſenſible place.

§. 4. A violent and Burning Heat muſt be felt upon theſe accounts, 1. Becauſe there is a greater quantity than ordinary runing in the paſſable Canals, there muſt be a greater Motion than ordinary, and conſequently a greater heat. 2. Meerly upon the account of the encreaſed Quantity, (without conſidering the thereby produc'd greater Velocity) there muſt be felt a greater Heat. For ſuppoſing the Heat in each ſingle particle to be the ſame as before; Yet ſince the particles are more numerous in the ſame Place, the heat muſt be greater there too. As in Rays contracted by a *Concave ſpeculum*. 3. The *Glands* being obſtructed, *i. e.* the paſſages of perſpiration, the natural Heat muſt thereby be keept in, and conſequently the whole augmented *per*

Lemm 1. Hence proceeds our unquenchable Thriſt; the Humidity (*i. e.* the thineſt parts) being more ready to evaporate, (ſince now the ordinary paſſages are obſtructed) the reſt muſt be proportionally dryer.

§. 5. The Difficulty and frequency of Reſpiration, and the violence of expirations, is hence eaſily accounted for: The quantity of Blood being augmented, there muſt a proportional greater quantity thereof be deriv'd into the *Arterys* of the Lungs, and ſince every one of the little Veſicles of the *Bronchi* ly betwixt two *Arterys* thus inflatted, it will be harder to explicate their Veſicles; and therefore one in ſuch a ſtate will naturally with all his force endeavour to ſuck in the Air, which will be forc'd out again, both by theſe inflated *Arterys* and by the force of the *Muſ-*

les

cles of the *Breaſt*, *Diaphragm*, an *Lungs*, which is vaſtly augmented both by the greater Quantity of Blood and of the *Liquidum Nervoum* and it's more plentifull dirivation ; as has been ſhou'n in §. 1. about the Frequency and ſtrength of the Pulſes.

§. 6. The Tongue is rough and diſcolour'd, Becauſe by the violent motion of the Blood, and the Obſtruction of the common paſſages, the humidity is evaporated, and the extraordinary Heat ſtiffens the *Fibres* thereof For it is evident that only heat and dryneſs diſcolour the Tongue. *Vide* §. 4.

§. 7. Want of Sleep moſt follow both : Becauſe there is ſuch plenty of Blood, and conſequently of the *Liquidum Nervorum* (as is ſhow'n §. 1.) that there is no need of Sleep to generate more, which is one principall uſe thereof: and becauſe of diverſe diſorders of the Head (accounted for §. 3.) which will not allow that tranquillity which is neceſſary to bring it on; But moſt of all becauſe (by the plenty of the *Liquidum Nervorum*) all the *Muſcles* both involuntary and voluntary (eſpecialy thoſe who want *Antagoniſts*) are in continual violent motions which muſt neceſſarly hinder Sleep.

§. 8. Ravings proceed from the diſorders in the Head, accounted for §. 3. The *Nerves* being diſtracted by the aboundance of their Liquor, the Heat and dryneſs of their parts cannot perform theſe reciprocations which are neceſſary in ſound perſons.

§. 9. The clear and Flame-colour'd Urine proceeds from the velocity of the Blood, which ſeperates thereby only the thineſt of the mixt Fluid: as ſhall be ſhown when we come to peak about Secretion.

§. 10. The vaſt encreaſe of ſtrength in perſons labouring under high Fevers is evident from *Lemm.* 2.

§. 11. Laſtly, the ceaſing and diſſolution of Fevers by Purging, Sweating, Vomiting and Abſceſſes, is wonderfully accounted for from this *Theory.* For if they go off by the ſtrength of Nature, then ſeeing the greater Quantity and Velocity of the Blood produce a greater *Momentum*, by the frequent concuſſions & force of this, the Obſtructions are ſhatter'd and waſh'd away till the laſt ſtrokes carry away all together; and thereby go off in theſe or thoſe, according as theſe or thoſe *Glands* were moſt obſtructed. This will be better underſtood when we come to ſpeak of *Mercurial Medicines.* If by the aſſiſtance of Medicines, then the Medicines muſt be ſuch as are moſt proper for removing theſe obſtructions, as ſhall be afterwards ſhown.

1. Thus I think I have accounted for all the appearances of *Continu'd Fevers*, which I reckon one conſiderable argument for our *Theory*.

2. All we ſee done in the diſſolution or ceaſing of ſuch *Fevers*, is the opening the *Glands*, the driving out the ſtagnated Fluids therein contained, which, *per poſtul*· 2. is another argument. And indeed one would hardly keep himſelf from thinking, if the removing theſe obſtructions remov'd the diſeaſe, then the puting them caus'd it; *quo poſito ponitur, & quo ſublato tollitur.*

3. All that is obſervable upon opening perſons cut off by *Fevers*, is (the reſt being ſound and intire) an extraordinary Swelling and Lividity in the internal *Glands*, Particularly of the *Lungs*, the *Liver*, the

Splen and the *Meſentery*; as has been obſerv'd by *Borelli* and others. *Vide Borelli de Motu Animal.* Part 2. prop. 227. This is one occular *demonſtration* of our *Theory*; and if the other *Glands* were as conſpicuous, I doubt not we ſhould ſee the ſame in them.

4. A fourth Argument for our *Theory* is from what Dr. *Pitcairne* has demonſtrated in His *Treatiſe* of the *Cure* of *Fevers*: For ſince in *Fevers* the *Glands* are obſtructed, *i. e.* the conduits of inſenſible Perſpiration, then by removing this obſtruction, *i. e.* by encreaſing the inſenſible Perſpiration, *Fevers* will be more probably cured, than by encreaſing all the ſenſible Perſpirations: And that in the proportion the number of the *Glands* of the whole Body has to the number of the *Glands* of the *primæ viæ*, or as the whole outward and inward *ſurfa-*

ces have to the *ſurfaces* of the *primæ viæ proximè.*

5, A fifth argument is from what *Bellini* has demonſtrated in his 3 & laſt Prop. in his *Section, De Febribus*. He there ſhews continu'd *Fevers* may ariſe from a Vitiation in the Quantity, Quality, or Motion of the Blood; from all or either of theſe. Moreover, from an encreaſe or diminution of the quantity of the Blood, there will neceſſarly ariſe an augmentation or diminution of it's velocity. The motion depends upon the Quantity multiply'd into the Velocity, and the Quantity ariſes (for the moſt part) from a Combination or the neceſſary effects of theſe. Hence you ſee all that neceſſarly follows upon the whole three, may be accounted for from the firſt of theſe, to wit, the encreaſe or dimuntion of the quantity of the Blood.

6. Amputations, Wounds, Fractures, and the like, wonderfully confirm this Doctrine. For there, a conſiderable number of the Blood-veſſels are ſtopt, and cannot make their Circle, and conſequently encreaſe the quantity of Blood in the reſt: So that generaly *Fevers* enſue, if the quantity be not leſſen'd by letting. It is true the violent Pain may concur, ſince all Pain is a *Stimulus*, and all *Stimulations* occaſion a more plentifull derivation of the *Liquidum Nervorum*. But if the quantity of Blood be not ſupposd augmented, that liquor muſt neceſſarly fail in a ſhort time.

7. We may ſee viſibly in *Fevers* of Cold there is a violent Obſtruction of the *Glands* of the *Skin*, the *Mouth*, *larynx*, *Stomach*; In a word, of all theſe *Glands* to which the Cold Air is contiguous, and we can tell whence this Obſtruction procceds; Beſides this *Fever* may be encras'd

to ſuch a degree as to differ little in it's ſymtoms, violence, or duration, from other more dangerous continu'd *Fevers*, which is a clear demonſtration of our Doctrin: For ſince an evident Obſtruction of the *Glands* produce *Fevers* ſo very like the moſt dangerous ones; why may we not conclude that ſome latent and unknown cauſe may produce ſo general & ſtrong an Obſtruction, as is able to occaſion all the ſeveral more dangerous *Fevers* of this kind?

9. But that which I take to be alone (without any other Proofs) a demonſtration of our *Theory*, is, That in all Couutrys betwixt the *Tropicks*, their Coutinu'd or Hot *Fevers* ariſe from a ſevere Cold Wind ſuddenly blowing after exceſſive Gleams of Heat. This is ſo true, that all Travellers aſſign this as the cauſe, having conſtantly obſerved

obſerv'd their *Fevers* to ſucced ſuch ſudden changes of the Air. A pregnant Inſtance of which we have in *Phil.Tranſ.* for *Decem.* 1699 *N.* 259. In a Letter from Mr. *Hugh Jones* to Dr. *Woodroof*, concerning ſome obſervables in *Mary-Land*, His words are theſe " The North " Weſt Wind is very ſharp in " Winter, and even in the Heat of " *S*ummer it mightily cools the Air; " and too often at that time a *S*udden North-Weſtern Wind ſtriks " our labourers into a *Fever*, when " they are not careful to provide for " it, and put on their Garments while " they are at work. Thus he. And indeed the genuin account of the matter is this; The exceſſive heat muſt neceſſarly dilate the *Glands* to which it is contiguous, *i. e.* all the *Cutaneous Glands*, the *Glands* of the *Trachea*, *Bronchi*, *Oſophragus*, *Stomach*, and of the *Inteſtines*;

and it will not only Dilate them, but (by the aſſiſtance of the natural action of theſe, which is Secretion) exhale their reſpective Liquors, making them ſtill flow, ſo long as the exceſſive Heat continues, and as there is Blood which may ſupply them: Now they being thus dilated and (by the *Efflux* of their Liquors) ſoft'ned and made ſpungy, a ſudden exceſſive Cold ſupervening, muſt ſtrongly contract their Orifices and congeal their flowing Liquors; and the greatneſs of their contraction will be always in proportion to the violence of the former Heat and ſupervening Cold conjunctly; as is known from the nature of Cold. And this Contraction of their Orifices & congelation of their Fluids, will obſtruct the motion of the Blood almoſt up to the Heart, at leaſt to the next diviſion of that *Artery* which conſtitures this *Gland*; whereby both the Blood will be encras'd as to it's Quantity, and perhaps (by this ſtagnation of a part of the ſame) as to the Quality thereof likewiſe. All which is but a *Corollary* of our *Theory*.

10. Hence we evidently ſee the reaſon of the frequency of our laſt Years Fevers: For we were then exactly (in proportion to our Climats) in the ſtate of theſe betwixt the *Tropicks*. Our Summer-Day heats were more violent than had been obſerv'd among us in the Memory of men, and our nights had no way the Heat proportionate to our days: Beſides we had often ſudden changes, which tho' not ſo Violent as in theſe warmer Countreys; Yet had the ſame (tho' a ſlower) effect as among them: And therefore it was that frequent Vomitings were found ſo uſefull, which

(at leaſt in ſuch a degree as was found then neceſſary) is not always ſo ſafe. The Practice was entirely conform to that of theſe Southern Countreys, and the neceſſity thereof will be underſtood when we come to ſpeak of *Vomiting*. The ſame practiſe obtains in Fevers occaſioned by ſurfeiting or Drunkneſs; which is ſtill to be ſuſpected as a conſiderable part of the cauſe of Fevers in adult Perſons in great Citys.

And generally, I ſhould think either the above-mention'd ſudden changes (which may happen a Thouſand other ways different from the Seaſon) or a direct continu'd fitt of violent Cold, or exceſſes in Eating or Drinking; one or all of theſe, have a large ſhare in moſt of our Continu'd Fevers.

11. Laſtly, it is no ways accountable from any other *Theory* (as I think) how theſe Liquors which

are ſecreted from the *Glands* at the Diſſolution of Fevers, could be ſo different from the ordinary fluids which are there excern'd. From ours it is evident, for an Obſtruction of the *Glands* muſt neceſſarly make their reſpective Liquors to ſtagnate, which will many ways alter their nature. But from any other *Hypotheſis* I doe not ſee how this can come to paſs; which will lead me to conſider one or two of the commoneſt Opinions about continu'd *Fevers*.

The moſt common and generally obtaining Opinion about Fevers is, that they are more immediately produc'd by ſome *Morbifick* matter; (like a Poiſon) which mixing and circulating with the maſs of the Blood, Produces all thoſe frightfull Symtoms which we feel. This Opinion is ſufficiently confuted, *Prop.* 222, 223. 224. 2*dæ. part*. of *Borelli*'s Book

De mot. Animal: whither I refer the reader;only adding (to what he has there adduced) this one Argument.

When any Corrupt Matter is mix'd with the Blood, ſo as to vitiate the whole maſs, (as Vinegar among Water) the way of Cureing ſuch a vitiation is either by forming new *Glands* to derive the vitious part of the mixture; or by draining the whole mixture good and bad, and Subſtituting new pure Blood in it's place: or laſtly by diſpoſing the already form'd *Glands* to ſecern the corrupted part.

The firſt of theſe is ridiculous.

Some thing like the ſecond is done, when the Blood is really vitiate in the whole; as inveterate Poxes, but that cure cannot here have a place as ſhall be afterwards ſhewn.

As to the third way; let us conder,

1. How hard it is to think (when the wole Maſs is ſuppos'd corupted) that the vitious part all at once: or in the ſpace of a few Hours (in which time we know, after a *Criſe*, Fevers commonly leave People) ſhould be intirely evacuated. This is not like the actions of Nature, who works leiſurely and by degrees.

2. Let us conſider, whence all the *Glands* (at leaſt the greater part of them) ſhould be ſo alter'd (ſeeng their configurations are ſo different, and naturaly they ſecern ſo different Liquors) as, all at one time to ſeparate the ſame *Morbifick* matter. And,

3. How at the *Criſe* only, and at no other time, they ſhould be ſo diſpos'd.

It will be very hard in any other *Theory* (in this more particularly) ſave ours,to account for theſe things without recurring to miracles,or the

abſurd *Me-*

Metaphorick Terms of Sympathy, Antipathy and the like. Theſe then, what *Borelli* has brought againſt this Opinion in the forecited places, are abundantly ſufficient to ſhow the ridiculouſneſs thereof.

But there are ſeveral Phyſicians, who obſerving, that (in Fevers occaſion'd by intemperance) there was (by a Vomit) a tough viſcid matter thrown out of the ſtomach, have thought this matter, generated there, and mixing with the maſs of the Blood, might be a conſiderable Part of the cauſe of *Fevers*; at leaſt might conſiderably augment the ſame, and have from thence brought Arguments for the neceſſity of Vomiting in Fevers.

This opinion ſuppoſes theſe things,

1. That the Quantity of the *Morbifick* matter excern'd by a Vomite, before the Adminiſtration thereof, was exiſtent in the cavity

of the Stomach, after the ſame manner that other things are, which are deriv'd into the maſs of the Blood, elſe it could never get thither. This I ſhall conſider when I come to ſpeak of the Operation and effects of Vomiting.

2. That it is at leaſt poſſible, this *Morbifick* matter may be deriv'd into the maſs of Blood; let us at preſent conſider this.

I know no way any thing of any tolerable conſiſtence, can get into the maſs of the Blood; but by the *Lacteal Veins*. It is true, from the ſudden effects of ſome ſpirits, Medicines, and ſtrong meats, we are certain, that the more refin'd parts of theſe, may get into the *Brain*, without going the tedious Circle of the *Lacteals*: But this is done by the Reciprocal motion of the *Nervs*: the neceſſity and Mechanical Operation of which *Borelli* has demonſtrated, *prop.* 155. 157. 160. 2*dæ.*

part: De motu Animalium. However, I think none will pretend ſuch a courſe for this viſcuous *Morbifick* matter: And therefore if it gets into rhe maſs of the Blood, it muſt go the common road of the *Lacteals.*

To decide the matter, I muſt ſuppoſe my Reader to have conſider'd the 2 laſt *props.* (*Ex ijs quæ ad ſeparationes*) which *Bellini* has in his *Preface* to his Book *De Urinis & Pulſibus* &c. and the 27. 28. and 40. of his laſt Book *De Motu Cordis* &c. where the conſtruction of the *Glands* and the manner of ſeparations are demonſtratively unfolded, which I take to be the nobleſt diſcovery (in theſe matters) of this age. From theſe places it is clear that.

Prop. 1. A *Gland* is nothing but a great many complications and circumvolutions of the *Artery* (all over the coats of which little branchings of *Nerves* paſs, deſign'd principally for the Spiral Contortion thereof; that the Blood may be the more eaſily propogated through the ſame: But this is common to all the *Arterys*, and *Veins*, whereby, without any Interuption of the ſame ſpire the propagation of the Blood (in the former) from the heart to the extremitys of the Body, and from the extremitys to the heart back again (in the latter) is aſſiſted) which ſends out from the ſides thereof, little Secretory Canals, which terminat in one common conduit: (and is call'd the *Emiſſary* of the *Gland*) or perhaps in a common *Pelvis* (as in the *Kidneys*) and the ſame *Artery* after theſe windings degenerates into a *Vein*.

Prop. 2. That ſeparation or ſecretion is perform'd by the compoſition of two motions in the Fluid; one propagated through the length of the Canal; another tranſverſly through it's ſides (for it is demonſtrable that all Fluids preſs *undiquaq;* and that the direction of their preſſion is perpendicular in every point to the ſides of the containing veſſel). The compoſition of which two, is the motion (or rather direction) of the ſeparated Fluid.

Prop. 3. That in a mixt Fluid, conſiſting of greater and leſſer coheſion of parts, of greater and leſſer Fluidity: That which has the leaſt coheſion and greateſt Fluidity, is firſt ſeparated (*i. e.* is ſeperated in the *Glands*, whoſe compunding *Artery* is ſhorteſt, or at leaſt diſtance from the heart, or fountain of Motion) And theſe of the next coheſion, and next greateſt Fluidity is next ſeparated; and ſo on: The diſtances from the Heart being in a compounded proportion of theſe.

Prop. 4. That the *Inteſtins* are really ſuch a *Gland*, and the moſt viſible one in the Body; whoſe ſecretory Veſſels, are the *Lacteals*; & whoſe common conſervatory or *Pelvis*, is the *Recepaculum Chyli.*

To theſe I ſhall add (because of it's affinity) the following.

Prop. 5. The quantity ſeparated in every *Gland*, is in a compounded proportion of the celerity of the Fluid at the reſpective Orifices; And of the Orifices themſelves, of the ſeparating Canals.

I ſhall here ſubjoyn the Demonſtration of this Propoſition; referring (that of) the reſt to their Author.

DEMONSTRATION

THE Orifices being given, the quantity ſeparated is as the celerities of the Fluid: For in a greater celerity, there is a greater quantity ſeparated; in a leſs celerity, a leſſer quantity

The Celerities being giv'n, the Quantity ſeparated is as the Orifices, For at a great Orifice there is greater quantity ſeparated, at a leſs Orifice a leſſer quantity: And therefore neither being giv'n, the quantity ſeparated is as the celeritys reciprocally, and the Orifices directly. *q. e. d.*

From all theſe, I draw the following

COROLLARIA

1. THe ſeparated Fluids differ only in their degrees of Coheſion and Fluidity. *per Prop.* 2.

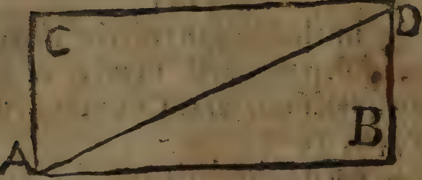
2. The reaſon why Fluids of different degrees of Coheſion and *F*luidity, are ſeparated in ſuch and ſuch *Glands*, is the different degrees of the Velocity of the *F*luid at the reſpective Orifices of the ſeparating Veſſels, and the differences of the Orifices themſelves, *per prop.* 3.

3. The *Glands* themſelves differ

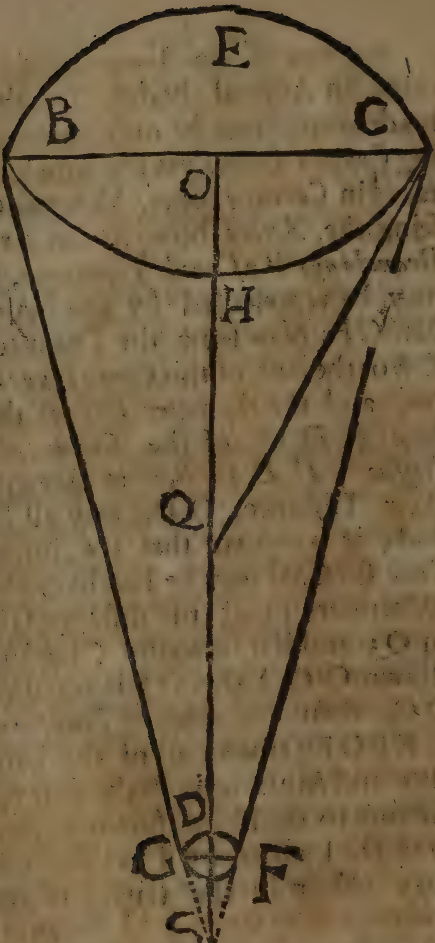
only in the length of the *Artery*, the difference and number of it's Complications and Convolutions, *per prop.* 1.

4. Each *Gland* (naturally and equally working) ſeparares only the *Fluid* proper to it ſelf; *i. e.* peculiar to ſuch lengths and complications, of ſuch degrees of *Fluidity* or Coheſion, to ſuch Bigneſs or ſmallneſs of the Orifices of the ſeparating Canals; *per Prop.* 3. and 5. But this laſt is of ſmall conſideration.

5. That Secretion may be perform'd the moſt eaſily that may be, the inſertion of the ſeparating Canal ought to be at an *Angle* of 45. degrees with the *Artery*, *per prop* 2. For let A B Repreſent the *Artery* (if it make a Right line) or it's *Tangent* (if it make a Curve) and let the motion of the *Fluid* be from A to B, the right line A B will likewiſe



wiſe repreſent its direction, propogated from the Heart. Erect at A the perpendicular A C; this will repreſent be the direction of the lateral preſsion of the Fluid. Compleat the Parallelogram ABCD. The direction of the compoſition of theſe two motions will be the Diagonal AD, as is known; which in the preſent caſe, makes an Angle of 45 degrees with the *Artery* A B. This were well worth the obſerving (if it be poſſible) in Animals; but it muſt be in live ones, before their parts have alter'd their Poſitions. And here it were worth the examining likewiſe, whither what Mr. *Newton* has demonſtrated (*Schol. prop* 35. *lib.* 2. *Princip. Phil. Mathem.*) about the reſiſtance of *Concical* Figures, ob tains in Animal Bodys, For tho his demonſtration be only concerning *Convex Conees*, yet the ſame obtains in *Concave* ones, Wherefore ſeing the *Artery* betwixt any two *Branchings* is a *Conus Truncatus*, it may be repreſented by the figure *CEBGF*; Now ſeing the Diameter C B of the baſe of this *Conus truncatus*, and the diameter *F G* of the Baſe *F D G* of the *Conus abſciſſus* *F D G S*, as likewiſe their Diſtance, O D, may all be had; it is evident that the intire *Cone* CBGSH may be had likewiſe: Wherefore Biſect the diſtance OD in Q; and if it be found (having drawn C Q) that Q *S* is equal to QC, then the *Conus Truncatus* CEBGF (among all of the ſame Baſe and Altitude) giv's the leaſt reſiſtance to the Blood flowing from O to D. I am enclin'd to think this may obtain in the truncs of the great


E
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great *Arterys*; betwixt their branchings. (for no further is to be conſidered) This I recommend to be examin'd for the honour of that great Man, who has crouded up in this *Scholium* (not to mention the reſt of his admirable Book) a vaſt number (if retail'd) of moſt Charming and uſeful Truths.

To come now to the Buſineſs; The *Teſticuli Humani* are granted by every one, to be *Glands*: and *Bellini* has found the length of the complicated *Artery* in one of them, to be 300 Ells, and the Altitude of one of theſe *Glands*, (when freed of its integuments) to be $\frac{1}{16}$ Ell: Whence I conclude, there muſt be 4800 Plications, or Circumvolutions in one of theſe, *Proxime*. He likewiſe aſſerts, That (*cæteris paribus*) if two Fluids of the ſame Nature, with equal Velocities, the one be forc'd into a Canal of the ſame Number and Lengths of Complications, as are in the foreſaid *Gland* and the other into a ſtreight Canal of the ſame length ; The Velocity (in or about their *Exits*) of the firſt *F*luid, to that of the ſecond, will be as 1 to 4800. He has not indeed ſubjoyn'd the Demonſtration ; *B*ut if we ſuppoſe the *Artery* to ly in P*licæ* or folds of ſuch number and lengths, as we have juſt now determin'd; (which is perhaps not far from truth :) and if we ſuppoſe the Turnings of the *Plicæ* to be circular ; (which perhaps may follow from this, That ſeing a Circle is the only ordinat figure of an infinite number of equal Sides, and equal Angles ; it muſt be the only *Curve*, which can make (in all its parts) the Angle of *Incidence* equal to the Angle of *Reflection*, and conſequently the only *Curve* in which a Fluid wou'd moſt eaſily turn) and likewiſe the Arch in which they turn to be a Semicircle: (which it muſt be, if the ſides run Parallel after the turning; and Univerſally, if the ſides produc'd make any Angle from the quantity thereof the quantity of the Arch in which they turn, may be determined.) I ſay, from theſe *Data*, the former Proportion may be by Calculation examined; or perhaps more briefly by Experiment, thus:

Take a Pipe of Metal of any Diameter, and fold it into any determin'd number of *Plicæ*, whoſe ſides may run parallel, and whoſe lengths may be $\frac{1}{16}$ ell: Then by a weight force a liquor through it and obſerve the time betwixt the firſt entry of the Liquor into the complicated Canal, and it's firſt appearance at the other Orifice; Then take another ſtreight one of the ſame length with the former, and with the ſame weight force the Fluid through it; obſerving the ſame way, the time of it's paſſage.

The Lengths being the ſame, the Velocities ſhall be as the time of paſſing reciprocally, as is known. Having thus got the Proportion of their Velocitys in any one determined number of *Plicæ*, we may (by the rule of *Three*) have their Proportions in any aſſignd number thereof. Suppoſing then that this great Man has found the truth of the foreſaid Proportion from ſome ſuch way, as one of theſe; It follows, That in every turning, the volicity muſt be abated $\frac{1}{4800}$ of the whole *Proxime*: (for 4800 : $\frac{4800}{4800}$ :: 4800 1.) Now let us ſuppoſe the Proportion of the Coheſion and Fluidity of the Fluid ſeparated in the *Teſticuli Humani* to the Coheſion and Fluidity in our *Morbifick* matter, now deriv'd from the Stomach into the ſmall *Inteſtines* to be as 1 to 2. (I mean the Coheſion & Fulidity of the Fluid ſeparated in the *Teſti-*

culi Humani, as it is when immediatly ſeparated. For when it has lodg'd any time in the *Veſiculæ ſpermaticæ*, we know by its Ebullitions and the Evaporation of its Thiner Parts, it loſes a great deal of its Fluidity.) And that this is a liberal allowance, is evident from *Leuvenhoek*'s Experiments ſcatter'd up and down the *Phil. Tranſ.* and Printed all together at *Amſterdam*; where we may ſee from the *Microſcopial* Obſervations he has made on this Fluid, its Fluidity is little leſs than that of common Water: And conſequently, at leaſt, Ten times more than that of our *Morbifick* matter.

And here I hope it will not be impertinent, to ſet down a Propoſition to compare the Viſciditys of different Liquors

PROPOSITION.

LET two Drops of two different Liquors fall into a pair of

fine

fine *Scales*; (a Drop of the one Liquor into the one Scale, and a Drop of the other Liquor into the other Scale) ſo that there fall no more than juſt their own Gravitys carry down : Thus you ſhall have, what I here call, their Comparative Gravities ; and by the ordinary Method, you may likewiſe have their *Specifick* Gravities : Theſe being giv'n ; I ſay, their Viſcidity & Coheſion ſhall be in a compounded Proportion of their *Specifick* Gravities reciprocally, and their comparative Gravities directly. The Demonſtration is eaſie from the Nature of Fluids.

Let us again ſuppoſe the length of the ſmall Guts (for it is there only where any thing is ſeparated from the *Inteſtines*) to be 6 Yards; and that in every $\frac{1}{16}$ of a Yard, there is a Plication : (And that theſe are likewiſe liberal Allowances ;

any who have ever ſeen a Diſſection will know.) Then there will be 96 Plications in the whole; and conſequently the Fluid in theſe *Inteſtins*, will loſe but 96 parts of the whole Celerity it had at its entry.

Laſtly, Let us ſuppoſe, That Celerity to be equal to the Celerity of the Blood, when it firſt enters the Plications of the *Teſticulus Humanus*; (which all will readily grant, who conſider, that there is never any thing found in theſe ſmall Gutts, but a thin Liquor in wide Canal, thruſt forward by the force of the *Fibres* of the Stomach & *Inteſtines*) Let us call this Celerity *a*.

Now from *Corol*: 1. 2. and 3. about Separation; If a Viſcidity, as 1 give 4800 Plications, then a Viſcidity as 2 will give 9600 ſuch. And therefore, that ſuch a Viſcid Liquor ſhould be ſeparated, it is requiſit it ſhould loſe 9600 parts of the whole

Celerity: But (as has been juſt now ſhown) by the *Plicæ* of the *Inteſtines*, the Fluid will loſe but 96 parts of the Celerity *a*. Whence it is abſolutely impoſsible that the *Inteſtines* ſhould ſeparat this Viſcid matter, unleſs they were a Hundred times longer than they are: For 96:9600::1:100. If the Viſcidity of the Fluid ſeparated in the *Teſticulus Humanus* were to that of our *Morbifick* as 1 to 10, then the ſmall *Inteſtines* behoov'd to be Five Hunderd times longer than they are. And indeed I believe the Proportion really not to be under 1 to 50; and then they behoov'd to be at leaſt 25 Hundred times longer than they are.

Thus we ſee the ſecond thing (this Opinion ſuppoſes,) is falſe; and indeed, it hardly could be otherwiſe; for, (in my Opinion) the *Fæces* themſelves might more probably get into the Maſs of the Blood, than this viſcid matter, the parts of theſe being only united by a ſimple Contact: Whereas the parts of this are joyn'd by a very ſtrong *Niſus*. And I remember, Dr. *Liſter*, ſome where in the *Phil. Tranſ.* relates how he try'd to get in a very fine ting'd Spirit into the *Lacteals* of a live *Dog*, by cuting the ſmall Guts, and injecting the Liquor, then ſewing all up again: But cou'd he never get it done to his Satisfaction. And here it is to obſerv'd, that people may be deceiv'd with Blue Tinctures; for this is the Natural Colour of theſe *Lacteals* when they are almoſt or altogether empty.

If it be objected, 1. That the Concoction of the *Stomach* and *Inteſtines* may fit this *Morbifick* matter, to be ſeparated by the *Lacteals*. 2. That the *Periſtaltick* Mo-

Motion and the *Valves* of the *Inteſtines* may hinder the quick motion of the compounded *Chylous* mater. 3. That there are ſome Medicaments, as *Turpentine*, &c. which we know by their effects, get into the maſs of the Blood, and yet are more viſcid than our *Morbifick* matter. 4. That there is really as viſcid matter ſeparated in ſome other *Glands*, as the *Bile* and the *Phlegm*.

To theſe I anſwer,

1. As to the firſt, ſeing *triture* is the only effect of the Stomach and *Inteſtines*, there is no advantage to be reap'd thence; for no beating nor grateing will diſſolve the union of this *Morbifick* matter. Besides where it is in any plenty, the effects of Concoction are very ſmall, or none,

2. As to the Second; The *Periſtaltik*

iſtalitick motion being reciprocal, it adds as much (to the motion of the *Chylous* matter) in it's deſcent towards the *Rectum*, as it takes away, in it's aſcent towards the Stomach ; and ſo cannot ſerve that end, the *Plicæ* and circumvolutions of theſe *Inteſtines* (which we have conſider'd) being only to be rely'd on, for this purpoſe. As to the *Valv's*, we know they all open toward the *Rectum*, and ſerve only to ſtop the aſcent of the *Fæces* in the Periſtaltick motion, and ſo cannot retard the motion of the *Chylous* matter.

3. As to the Third; We likewiſe know, that all theſe Medicaments are diſſolv'd into a thin Liquor by heat (as *Turpentine*, Butter, &c.) Beſides that only the moſt ſpritious and leaſt viſcid parts enter the Blood; which is not ſaid of our *Morbifick* matter.

4 As to the laſt: There is a great difference betwixt a Liquor immediatly after it is ſeparated, & when it has Stagnated ſometime in the Conſervatory of the *Gland*; for then the Aqueous and more humid *Parts* evaporat; and by it's ſtagnation it acquires an ineptitude to motion: And tho' the Blood flows very eaſily in the *Arterys* and *Veins*; yet I defy any to cauſe extravaſat Blood enter it's Veſſels again. But more particularly, we muſt conſider the *Liver* to be a very large Veſſel, and (and if it were evolv'd) to make an *Artery* many Thouſand times longer than that of the Canal of the ſmall *Inteſtines*, or *Teſticulus Humanus* either; and ſo it is no wonder it ſeperat a viſcid matter; the motion of the Blood there being very ſmall: But ſtill I aſſert it is not near ſo vicid as our *Morbifick* mat-

fer. As to the *Phlegm*, we know it is not naturally produc'd; and the *Morbifick* matter it ſelf (againſt which we diſpute) might be as well objected; for it is only the Stagnation, Corruption and Evaporation of the Humidity, which occaſion both; the ſame might be ſaid of the Purulent matter which paſſes by *Urine*, but that we know it proceeds from an *Ulcer* in the *Kidney* or Neck of the *Bladder*, and is not ſecerned with the *Urine*.

Having dwelt thus long on the opinions of others, I come now to conſider the proper remedys of Fevers; which I reduce to 1. *Blood letting* 2. *Vomiting*, 3. *Purging*. And 4. The *Medicaments* which encreaſe the leſs *Senſible Evacuations*; under which head I comprehend Sweating, Perſpiration, and the like.

I do not here conſider bliſtering and outward Applications; ſeing

(in my Opinion) they are only uſeful to remove the accidental effects, and not the cauſe of Fevers, without which they cannot be ſaid to be truly cur'd.

1. As for *Blood-letting*; The ſubject is ſo fully and learn'dly treated by *Bellini* in his foremention'd books together; that it were equally impoſſible as impudent to offer at any additions: And therefore for intire ſatisfaction on this head, I ſhall referr my Reader to theſe Books,

2. As to *Vomiting*; I ſhall comprehend all I have deſign'd to ſay about it in theſe particulars, 1. I ſhall ſhow that Vomiting is partly produc'd by the *vis ſtimulans Vomitorii*: But 2. That it is moſtly occaſion'd by the *vis ſtimulans* of the *Morbifick* matter excern'd from the *Glands* of the Stomach. 3. I ſhall prove that this *Morbifick* mat-

ter is not in the cavity of the Stomach (at leaſt in ſuch plenty as it is excern'd by a forc'd Vomite) before the ingeſtion of the ſaid Vomit. 4. I ſhal give the whole deduction and connexion of this Operation; And 5. ſhall conſider the advantages of the ſame in the cure of Fevers.

Before I come to handle theſe, it is neceſſary I firſt explain what I here mean by a *vis ſtimulans*.

By a *vis ſtimulans*, I underſtand ſuch a Quality in a Fluid, whereby the particles thereof are diſpos'd to make a real diviſion or a violent inflexion of the *Nervous* and *Membranous Fibres* of the Body, which occaſions frequent and forceable reciprocations, ſuccuſſions and derivations of the *Liquidum Nervorum* into the *Muſcles* and contractile *Fibres* of the Canals; whereby all the involuntary *Muſcles* are brought into violent contractions, and the emiſſarys of the *Glands* are ſqueez'd.

Thoſe who deſire a fuller account of the nature and mechanical Operations of this *vis ſtimulans*, may ſee it *Pag.* 165. and *Seqq.* of *Bellini's* Book *De Urinis & Pulſ.* & *Prop.* 52. of his laſt Book *De Motu Cordis.* I ſay then,

1. *Vomiting* is *Partly* produc'd by this *vis ſtimulans Vomitorij*; This is evident from theſe conſiderations. 1. Becauſe ſometimes we immediatly Vomit upon the Ingeſtion of the Vomitory, before the *Morbifick* matter excern'd from the *Glands* of the Stomach could have time to concur. 2. We throw up very often the ſame we had taken in, with litle or no mixture; which could not happen, if the *Morbifick* matter had concur'd to produce the fit. 3. Sound perſons (in whoſe

Stomachs there is little or none of this *Morbifick* matter) often Vomit upon a too plentiful ingeſtion of an (otherwiſe) inoffenſive Liquor. The only reaſon of which muſt be, that the Stomach not being able to derive into the maſs of the Blood, the ſaid Liquor, ſo faſt as it is pour'd in, it muſt Sowr on the Stomach, and thereby acquire this *vis ſtimulans*, whereby it is thrown out: or perhaps it may ſtill have a *vis ſtimulans*, tho' not (when it is in a ſmall quantity) ſufficient to bring the Stomach into that violent contraction which is neceſſary in Vomiting; But this ſmall *vis ſtimulans* being Multiply'd by the too great quantity of the Liquor, may acquire ſufficient force to produce the effect: as we ſee ſeveral things loſe the quality to produce their viſible Effects, when in ſmall, which they had when in great. But, 2.

I ſay, Vomiting is moſtly occaſion'd by this *vis ſtimulans* of the *Morbifick* matter excern'd from the *Glands* of the Stomach; and that for theſe reaſons, 1. The action of the *vis ſtimulans Vomitorij* being terminated at, or near the internal ſurface of the Stomach, after one or two plentifull fits of Vomiting (there being produced thereby ſuch a ſuccuſſion and compreſſion of the ſides of the Stomach) theſe *Particulæ Stimulantes* muſt neceſſarly be diſentangled; and ſo there could be no more fits of Vomiting, which is contrar to experience. 2. We evidently ſee in Sea-Vomits, and in thoſe produc'd by the Joltings of a Coach in ſome people, there is no *vis Stimulans Vomitorij* to which we can attribute this effect; and therefore it muſt neceſſarly be produc'd by the vellications of the Morbifick matter excern'd cern'd by this particular motion. The manner of which may be thus explaind,every particular body has a determin'd degree of tenſion and a determin'd length. And if a like reciprocation of motion (by whatſomever cauſe) be produc'd in the ambient *Medium*, which would neceſſar'ly be produc'd by another Body (when mov'd) of the ſame degree of tension, and of length commenſurable to the length of the firſt body, there muſt be of neceſſity a motion produc'd in that firſt body, eſpecially if the motion of the *Medium* be violent, and the commenſurable lengths be as the firſt numbers of the ordinary Airthmetick Progreſſion 1. to 2. or 1. to 3. or 2. to 3. &c. This is evidant in the uniſone or concordant Strings of greater Muſical Inſtruments: And the Reaſon is, becauſe thereby the *Oſcillations* of ſuch Bodies

dies become Commenſurable. Now I ſuppoſe this particular Motion of Jolting Coaches and Ships, to be ſuch, as would be produc'd by another Body having the juſt now mention'd Analogy to the *Nerves* of the *Glands* of the Stomach, whereby they are brought into motion, and conſequently derive great Plenty of their *Liquidum* into the places, which makes ſuch contractions as ſqueez theſe *Glands* of the matter, which produces theſe fits of Vomiting: Beſides that the ſame cauſe may (upon other *Fibres*) produce the antecedent Sickneſs which we feel in Sea-Vomits. 3. By a Vomite of warm water (for example) there are often produced ſeveral fits of Vomiting; and yet we all know there is no *vis Stimulans* in it; So that all it can do, is, that by it's warmth (which is a kind of a *Fotus*) it elicits the matter from the *Glands* of the Stomach, which occaſions this Vomiting: I cou'd add a great deal more to confirm this propoſition; but I think this ſufficient. I ſay,

3ly. That the *Morbifick* matter (excern'd by Vomiting) is not exiſtent in the Cavity of the Stomach, (at leaſt in ſuch Plenty as it is excern'd by a forc'd Vomite) before the adminiſtration thereof. 1. This is an evident Corollary from the former *Prop.* The Vomite does not Act (at leaſt after the firſt one or two fits) by it's own *vis ſtimulans*; There is (in Vomiting) produc'd a violent contraction of the *Fibres* of the Stomach, the *Muſcles* of the *Abdomen* and *Diaphragm*, which muſt be occaſioned ſome way; There is nothing(in Vomiting)which can occaſion this, but either the *vis ſtimulans Vomitorii*, or of the excern'd *Morbifick* matter; and ſince (as has been already prov'n) it cannot be the former, it muſt of neceſſity be the latter: Wherefore if the *Morbifick* matter were already exiſtent in the cavity of the Stomach, the Vomite were of little uſe after one or two *Fits*; which is contrar to experience. 2. If this *Morbifick* matter were already in the cavity of the Stomach, it is not poſſible but that one or two plentifull fits of Vomiting would eject all that is there; ſo that afterward there ſhould none be thrown out however violent the conſequent fits were, which is likewiſe contrar to experience. The force of the *Muſcular Fibres* of the Stomach, The *Muſcles* of the *Abdomen* and *Diaphragm* (which two laſt Monſieur *Chirac*, Profeſſor of Medicine at *Montpellier*, by an eaſy experiment, has ſhewn to concur principally in Vo-

Vomiting, *vide, The Preface of Tournfort's Hiſtoire des Plants qui Naiſſent aux environs de Paris*) is at leaſt equal to 260000 *lib.* weight; (the force of the *Muſcles* of the *Abdomen* and *Diaphragm* being more than that of 248000 *libs.* and of the Stomach, not inferior to that of 12000 pounds) which force if it be not ſufficient to drive out all that is exiſtent in the cavity of the Stomach (however Viſcid the matter be) I leave every one to judge. 3. Suppoſing the *Morbifick* matter already in the cavity of the Stomach; It is Impoſſible to give an account of the different effects of different Vomits: For Example, why an *Antimonial* Vomit does excern this *Morbifick* matter more plentifully than Whey or warm Water. For if before the Ingeſtion of either, the *Morbifick* matter is already in the Stomach, then the only thing left for them to do, is, to excite the Act of Vomiting: But it is certain they may be both brought to be equal in that, *i. e.* they may be both brought to excite an equal number of fits of Vomiting; and that with equal Violence (by taking their Quantitys in a reciprocal proportion to their Vomitive Faculties) And yet their effects be very different, otherwiſe I omit (for avoiding tedioúſneſs) the other arguments I can aduce to confirm this propoſition.

4*ly*. The whole deduction & Connection of this operation is thus: the Particles of the Vomitory by their *Incuneation* into the Orifices of the *Emiſaries* of the *Glands* adjacent to the ſurface of the Stomach, do dilate the ſame (which by ſome extrinſick cauſe had been contracted) and after the ſame manner do diſſolve (at leaſt in ſome degree) the Coheſion of the ſtagnant *Morbifick* matter ; and render it more Fluid; and conſequently, it's reſiſtance leſs: Now the natural and conſtant action of the *Glands* being Secretion; and the *Impedimentum* (by the dilatation of the Orifice and attenuation of the Fluid) being totally taken away, or (at leaſt) made leſs than the natural *Momentum* of the *Glands* ; The matter muſt neceſſarly flow into the Cavity of the Stomach, till it be accumulated in ſuch a Quantity (which not being to be done in an inſtant, muſt require ſome time) as is ſufficient (by the united loathſomeneſs and the *vis ſtimulans* of it and the Vomitory) to vellicate and force the *Fibres* of the Stomach, *Abdomen* and *Diaphragm* (by the communication of the *Nervs* of the firſt with the two laſt) into a violent contraction, and thereby throw all out by the *Oſophagus*, which brings all to quiet again: Till there be a new, a ſufficient quantity exerned from theſe *Glands* to reproduce the foreſaid Contraction: And thus there happens a fit of Vomiting and Quiet alternatly, till either all the *Morbifick* matter be thrown out, or the force of the Vomit ſo diluted, that it's no longer able to elicit the *Morbifick* matter from the *Glands*. Beſides theſe Primary effects of Vomiting, there are two others, which ought not (tho' leſs principal) to be omitted. The firſt is that in a ſtrong vomit, or in one which requires ſome conſiderable time before it operate, there often paſſes ſome part thereof from the the Stomach into the *Inteſtines*, and occaſions a gentle Purge, by diſſolving the *Fæces*, and vellicating the *Fibres* of the *Inteſtines*, as

ſhal

ſhall be more particulatly ſhown when we ſpeak of *Purgeing*. However the effects of this Purge very ſeldom or never go beyond the *Primæ Viæ*, For all gentle Purges (of which this is one) are confined within theſe. The ſecond is, that the ſtrong contraction in ſo many *Muſcles* and *Muſcular* Canals, which are at Work in Vomiting, and the violent concuſſion which is produc'd over the whole Body, by a power (as has been ſaid) which is not inferiour to that of two hundred and Sixty Thouſand pound weight, may and often does, take away the Obſtructions in many other Canals, than thoſe which are more immediatly concerned about the Stomach and *Oſophagus*, as we evidently ſee by that vaſt Sweat which alwiſe breaks out after plentiful fits of Vomiting. From theſe I deduce, 5*ly*. The Advantages of Vomiting in the *Cure* of Fevers; which are, 1. The taking away the Obſtructions of the *Glands* of the Stomach and (ſometimes) of the *Inteſtines*, which is the principal uſe of Vomiting; and how great a ſtep this is toward the Cure of Fevers, every one will ſee who conſiders, that in Fevers occaſion'd by Intemperance, the Stomach is the Scene where this great Miſchief is both contriv'd, and put into Execution; the Obſtruction of the *Glands* thereof, being the firſt and principal Cauſe of theſe Fevers; And in Fevers occaſion'd by Cold, the Stomach and *Inteſtines* being moſt Expos'd, and leaſt Defended from the Cold Air, receives its firſt and ſtrongeſt Impreſsions; which two (as formerly was ſaid) have the moſt conſiderable ſhare in the cauſe of our Continu'd Fevers: And there therefore it is, that Vomiting (being timeouſly and plentifully us'd) very often prevents ſuch Fevers. 2 Another Advantage of Vomiting is, That by the ſtrong Contraction of the *Muſcles* and *Muſcular* Canals and the violent Concuſsions of the whole Body thereby produced, the Obſtructions of many other *Glands* are remov'd. (as has been juſt now ſhown.) So that this with the former (removing ſo conſiderable a part of the Cauſe,) enables Nature to perform the reſt very eaſily. 3. A Third Convenience (if not Advantage) of Vomiting, is. That it is leſs dangerous than many of the Medicaments that are taken inwardly; The effects of this is confin'd to the *Primæ viæ*; (by which I alwiſe mean that winding Canal, which is continued from the Mouth to the *Sphincter ani*,) & is conſequently leſs dangerous than thoſe which run the Circle of the Blood : For it is not to be doubted, that all Alterative Medicines have more or leſs danger in them (from the effect of their Stimulations upon the *Nervs*, their Fermentations with the Blood, their Separating, or Promoting the Natural Coheſions of the Liquors of the Body, and their many other unknown Productions.) That which goes the leaſt way, muſt therefore have the leaſt danger: Now ſince it is certain, that Vomiting does not go out of the Stomach and *Inteſtines* (where the Canals are ſtrong and wide, and the Fluids are viſcid and groſs) there muſt of neceſſity be leſs danger in it, than in theſe which enter into narrower and weaker Canals fill'd with more Fluid and finer Liquors. It is true indeed, there is ſome hazard from the burſting of the Capillary Veſſels of the internal Surfaces, by the violent Concuſsions of the Body, occaſioned by Vomiting; but this is eaſily prevented by Blood-letting, which ought alwiſe to preceed the plentiful uſe of Vomitories in all Diſeaſes. Besides, ſometimes the violence of *V*omite, is too great for the ſtrength of the Patient; but this is rather the fault of the Physician than the Physick: For the Strength, and (conſequently the) violence of *Vo*mits (as of all other Medicins) ought to be adjuſted by this Proportion, *Viz.* They ought to be in a compounded Proportion of the ſtrength of the Patient, and the danger of the Continuance of the Diſeaſe. If this were obſerved, none cou'd ever Err in the Adminiſtration of Medicines.

III. Come we now to that which we call'd the Third proper Remedy of *F*evers, to wit, *Purging*;

In explaining of which, I ſhall 1. Shew that Vomitive and Purgative Medicines differ only in degrees of the ſame Quality. 2. I ſhall give a ſhort account of the ſeveral ſteps, and of the manner of this Operation. And 3. Conſider it's uſe in the Cure of Fevers. I ſay then.

1. That vomitive and Purgative Medicines, differ only in the degrees of the ſame Quality, *i. e.* Purgative Medicines, by encreasing their force vaſtly, and confining it to a leſſer Quantity, either of a Fluid or ſolid Body, become *V*omitive, & vomtive Medicines (if diluted) become Purgative. This will be evident from theſe Considerations. 1. We find by Experience, a ſtrong Purge never miſſes (if either it be very ſtrong, or the Patient not very ſtrong) to *V*omit, and the weaker part of a *V*omite, which eſcapes into the *Inteſtines*, does frequently

Purge us. 2. The ſame Medicines (for example, *Vinum Emeticum,*) taken by the Mouth, will provoke Vomiting, which giv'n by way of *Gliſter*, will Purge. The ſame obtains in all ſtrong *Emeticks.* In ſhort, all ſtrong Medicines of either kind conſtantly produce both theſe Effects. The reaſon of all which is this: If the Medicament of either kind be ſo ſtrong as immediatly to vellicat and ſtimulat the *Fibres* of the Stomach, to dilate the Orifice, and attenuat the matter contain'd in the *Glands* thereof, it produces Vomiting; if it act but gently, ſo as only to aſſiſt the Natural Motion of Digeſtion,it goes by the *Inteſtines*, and diſſolves the Coheſion of the *Fæces*, and finding there more ſenſible *fibres* is able to bring them into violent Motions which produce Purging, as ſhall be juſt now ſhow'n. 3 It is impoſſible in any other *Theory*, to account how theſe two different Medicines ſhou'd upon the ſame Parts produce different Effects; For both theſe Medicines are taken by the Mouth, go down the *Oſophagus*, and enter into the Stomach either in the form of a *Liquid*, or are there by it reduc'd into a *Liquid*; and conſequently are brought in to contact with, and Operat on the ſame *Fibres*, *Glands* and *Membranes*; and yet produce (by their aſſiſtance) two different effects. It is ſimply impoſſible to explain the manner of this, without ſaying the one acts more powerfully and forceably, and makes more violent Contractions, and conſequently is thrown up the moſt patent way; the other more gently and ſoftly, and has thereby time to ſeek out the leſs obvious paſſages.

2ly. The account of the ſeveral

ſteps, and of the manner of this Operation, is thus; Purgative Medicines, being receiv'd into the Mouth,and admitted into the *Stomach*, their particles vellicat and ſtimulat the *Fibres* thereof, and thereby encreaſe the digeſtive faculties, *i. e.* bring the *Muſcular Fibres* of the ſtomach the *Muſcles* of the *Abdomen* and *Diaphragm* into more frequent contractions than ordinary, till they are admited into the *Inteſtines*, the Fibres and *Glands* of which being more ſenſible than thoſe of the Stomach (whoſe parts by the frequent rough Contacts, of one againſt another, and of the groſs Bodies which are often thrown into it, are as it were dead'ned) they eaſily move and bring into frequent and forceable contractions whereby theſe *Glands* are ſqueez'd of a Fluid which lubricates the Paſſages; and mixing with the feculent matter of the *Inteſtines* (which is rendered Fluid by the ſame active and Stimulating quality of the Purgative medicine) renders it yet more Fluid, by which (and by the more than ordinary contractions of the *Inteſtins*) it paſſes more plentifully and eaſily into the *Rectum*, and is thence ejected. This is the uſe of the more gentle Purges which only cleanſe the *Inteſtines*. But thoſe of more force (beſides all theſe) doe (as to the greater and more ſpirituous part) enter into the maſs of the Blood by the *Lacteals*, and mixing therewith produce many unnaturall fermentations there in, ſeparating or promoting the natural Coheſions of the Liquors of the Body, and occaſioning many other unknow'n effects, as has been formerly ſaid: And likewiſe there, vellicating the ſpiral *Fibres* of the *Arterys* and *Veins* bring theſe into more forceable contractions, and thereby promote the Circulation of the Blood and make it run with greater Velocity and force; and by this means in a ſhort time waſh away any obſtructions that either happen to be in the more direct *Arteries*, or the more complicated ones which conſtitute the *Glands*, encreaſe the inſenſible perſpiration, and purify the Blood of all the groſſer and more noxious parts by the *Ductus Choledochus* and *Pancreaticus* which void themſelv's into the *Inteſtines*. All theſe effects of the more powerful Purgatives are Viſible; for ſometime after one has taken ſuch a ſtrong Purge, we find the Pulſe mightily increas'd, the Perſpiration augmented, the the Spirits or *Liquidum Nervorum* ſpent, the viſible Excretions by Seige and Urine much greater, and the Body weak'ned; eſpecially after a few days of ſuch a courſe. Whereby it is evident theſe Medicines muſt operate after the manner now explained. From hence it is clear,

3*dly*. That the advantages of purgeing in the cure of Fevers are very great, upon theſe two conſiderations. 1. If the Purge be more gentle ſo that it only ſerve to cleanſe the *Inteſtines*, it partly takes away the obſtruction of the *Glands* of the Stomach, and totally that of the *Glands* of the *Inteſtines*, which is a conſiderable ſtep toward the cure. But 2. if the Purge be more violent, ſo that it enter in any plenty into the maſs of the Blood, it conduces ſo much toward the removeal of the obſtructions of moſt of the other *Glands*, that nature is able to perform the reſt very eaſily her ſelf. But alas! this laſt caſe has ſo much danger

and ſo many inconveniencies in it, as render it as unſafe, as otherwiſe (if theſe could be remov'd) it would be uſeful. *Bellini* in his Book *De Urinis & Pulſibus*, page 222. has demonſtrated that in violent Purges there is a greater danger by far than in Blood-letting His words are " *Quia vero quicquid eſt ſuſpicionis in miſſione*
" *Sanguinis ad ſolum fermentationem non naturalem, quæ poſſibilis per ipſam eſt in reliquo Sanguine, redigitur, & hoc uno de nomine periculo non vacat; ſi igitur hujus mali ſuſpicione careret purgatio, illa potius adhibenda, quam venæ ſectio; cum purgatio ejus loco cætroquin eſſe poſſit: ſed res e' converſo ſe habet, ſuſpicio enim ejus mali a miſſione Sanguinis eſt ſuſpicio rei poſſibilis non tamen neceſſario prevenientis, aut neceſſario conjunctæ, cum qualibet miſ-*

" *miſſione Sanguinis ; in purgatione*
" *autem neceſſarium ſemper eſt San-*
" *guinem ſolvi a naturalibus Cohe-*
" *ſionibus, ſeu recedere & dimoveri*
" *a ſua compoſitione ; In Purgatio-*
" *ne igitur periculum erit certum,*
" *in venæ ſectione dubium: hoc eſt,*
" *erit Purgatio venæ ſectione peri-*
" *culoſior* &c. And there he goes on to ſhew how much more dangerous purgeingis thanBlood-letting: From this and a great deal more he has there adduc'd, it is evident, 1. That violent Purges have a great deal of real danger in them abſolutely, without reſpect to other remedies ; and Indeed theſe unatural Fermentations and changes of the Coheſion of the Fluids inſtead of promoting the cure, often encraſes the cauſe of Fevers, to wit the obſtruction of the *Arteries* which conſtitute the *Glands* . 2. That violent Purges are

are reſpectively much more dangerous than Blood-letting, wherefore this laſt is a more ſafe, and conſequently a more uſeful expedient in the cure of Fevers than the former. And I ſay, 3. that violent Purges are a much more dangerous remedy in Fevers, than Vomitings are; For Vomits extend no further than the *Primæ Viæ*, where the Canals are ſtrong and wide, the Fluid viſcid and Groſs, But violent Purges reach all the ſlender Veſſels and Noble Liquors of the Body, where the danger of any Conſiderable alteration is extreamly great. Wherefore upon this account, I ſay that the danger of Violent Purges is to that of Vomiting, as the length of the Canals of the whole Circuit of the Blood, is to the length of the Canals of the *Primæ Viæ*. And how much longer the firſt is than the latter, I leave the Reader to conſider. Beſides all theſe, there are ſo many other known and evident dangers in violent Purges, that the only part of Purgeing which is ſafe (in cureing Fevers) is *Gliſtering*, or the *Lotiones Alvi*, or, rather than either of theſe, only that gentle Purge which is the concomitant of ev'ry plentiful Vomiting.

IV. We are come now to the laſt proper Remedy of Fevers, which was the *Medicaments which encreaſe the leſs ſenſible evacuations*. But all that can be pertinently ſaid on this head; is ſo learn'dly and accurately already handled in a Treatiſe entituled, *Archibaldi* Pit-*carnij Diſſertatio de Curatione febrium quæ per Evacuationes inſtituitur*, that thither I ſhall refer the Reader, only adding the reaſon why ſuch Medicaments adminiſtred in the begining of Fevers, do rather

ne-encreaſe than cure them, which is this : In an Obſtruction of the *Glands*, the Blood in the Complicated *Arteries* which conſtitutes the ſame, ſtagnates up to the next Branching thereof, neareſt the Heart, & thereby a conſiderable length thereof becomes obſtructed and unpaſſable : the only way this obſtruction can be remov'd is by the force of the Blood, which in every Pulſe or contraction of the heart, waſhes off a particle of the ſame till the whole be dig'd away ; as ſhall be ſhown. Now the *Arteries* which conſtitute the *Glands* whereby the inſenſible evacuations are naturally ſecern'd being in the begining of the Fever ſo much obſtructed. It is ſimply impoſſible for ſuch Medicaments to carry theſe obſtructions off as they are juſt now, they muſt rather force through the ſuperficial *Arteries*, and theſe few other

Glands that are (perhaps) left paſſable, the natural humidity only; *i.e.* the thineſt Parts of the Blood, and conſequently make it more viſcid, and thereby the obſtruction; more firm; *i. e.* will encreaſe the Fever; whereas, when a great deal of theſe obſtructions in the *Arteries* are waſh'd away by the force of the Blood, *i. e.* in or near the decline of theſe Fevers, Such Medicaments will be able to force the ſmall remainder of theſe obſtructions either through the Orifice of the *Gland* or into the continued *Vein* till by frequent circulations it be either loſt, or thrown out of the Body.

From all that has hitherto been ſaid about the cure of theſe Fevers, It is evident.

COROLLARIA,

1 THAT the firſt thing incumbent upon a Phyſician in the caſe of theſe *Fevers* is to

let

lett a conſiderable quantity of Blood, both in order to remove the cauſe of theſe Fevers, and to prevent the inconveniencies of the ſubſequent Vomiting. *Bellini* in *Prop.* 5. & 6. *De Febribus* has demonſtrated that '*Vena in omni morbo eſt ſecanda, in quo minuenda quantitas, aut augenda velocitas, aut refrigerandum aut humectandum, aut aliquid adhærens vaſis dimovendum aut abripiendum.* Than which there cou'd be nothing more pat to our Theory.

2. The Second ſtep in the Cure of theſe Fevers, is Vomiting; for it at leaſt removes the Obſtructions of the Stomach and *Inteſtines*, and goes a great length to take away the Obſtructions of the moſt of the other *Glands* likewiſe. This eſpecially obtains in Fevers occaſion'd by Intemperance or Cold: As is evident from what

we have ſaid about Vomiting; But as for Purgeing in Fevers, there is very little more ſafe than what is the neceſſary Concomitant of all ſuch Vomitings.

3. The laſt, but moſt Univerſal, and ſureſt ſtep, is the encreaſing the leſs Senſible Evacuations: *B*ut this muſt be uſed only in the decline of theſe Fevers, as has been juſt now ſhown.

I have in this place only determined the Order and the ſeveral Degrees of the Efficacy of theſe Remedies (in the Cure of Fevers) with reſpect to one another: Their kinds and Quantitys being to be adjuſted by a former Analogy I have giv'n, when I was ſpeaking about the Advantages of Vomiting.

But here it may be very fairly ask'd why (ſince I make the Obſtructions of the *Arterie* and *Nerve* which conſtitute the *Glands*, the principal cauſe of Fevers) do not I allow Mercurial Medicines (which all grant to be one of the moſt proper, and perhaps *Specifick* remedies of obſtructions) to be one of the ſteps of the cure of theſe Fevers.

Before I anſwer this queſtion I ſhall 1. explain the nature of Mercury. 2. I ſhall ſhew the manner of the Operation of theſe Medicines; and 3, The advantages and uſefulneſs of them.

I. *As to the firſt I Suppoſe.*

1. That pure Mercury or Quickſilver conſiſts of parts (I mean thoſe of the firſt compoſition, by which I underſtand an aggregate of the Smalleſt and laſt conſtituent Particles of any Body, and an aggregate of theſe aggregates I call, of the Second compoſition: and ſo on)

exceedingly ſmall equal, and perfectly Speherical.

This has been ſuppos'd by All who have written any thing tolerable about the Nature of this Mineral. It is true indeed, ſome have ſuppos'd it ſo, becauſe they ſaw that dividing *Mercury* upon a plain (even by the aſſiſtance of a *Microſcope*) ſtill the upper part retain'd its Sphericity, which they could not ſo eaſily obſerve in other Fluids: *B*ut the true Reaſon of this is, The great Gravity of the *Mercury*, in reſpect of other *F*luids, and the uniform preſſure of the *Medium*. For all Fluids will retain their Sphericity till their *Q*uantity be ſo diminiſh'd, (either by their being another Heterogeneous ſpecifically lighter Body included in them, or by their Gravity decreaſing at a greater rate than their Surfaces) that they are of equal Gravity with an equal Portion of the Medium they are in, and then they will receive any Figure the Motion of the Medium can imprint on them. Howe're the diviſions of Mercury muſt be very ſmall before it can be reduc'd to this State; but that it can at laſt be brought to it, is evident from the mixing and pounding of Quick-ſilver among common water, in which we know a part of the Quick-ſilver is loſt, by the Diminution of its weight, and the diſcolouring and effects of this Water.

But the true Reaſon why the former Suppoſition is to be made, is, becauſe from it ſome of the Phenomena of Mercury may be accounted for.

For, from thence it is evident, why Mercury (tho' the heavieſt known Fluid) riſes with fewer degrees of Heat in an Alembick, than any other. 1. It's parts (of the firſt Compoſition) being exceedingly ſmall. *i.e.* ſmaller than ſuch parts of any other Fluid, it muſt riſe ſooner than they; becauſe the Gravity of its Particles has a leſſer Proportion to their *Surfaces*, than the Gravity of the Particles of any other Fluid has to their *Surfaces*; for the Gravities of Bodies decreaſe in a Triplicate Proportion, whereas their Surfaces decreaſe only in a Duplicate one. Thus ſuppoſing (for Example) the *Diameter* of a Particle of Mercury (of the firſt Compoſition) to be to the Diameter of a Particle of Water (of the ſame Compoſition.) As 2 to 300; (and we may juſtly ſuppoſe the Odds infinitely greater,) their *Surfaces* will be as 4 to 90000. And their Solidities *i. e.* their Gravities, as 8 to 27000000. This upon *Suppoſition* their *Specifick* Gravities were equal; but ſuppoſing (at the largeſt)

largeſt) the Specifick Gravity of Mercury to that of Water, as 15 to 1. The real Gravities of ſuch Particles will be to one another, as 120 to 27000000 : Whence it is evident, that not only the *ratio* of 8 to 4 or 2 to 1. But likewiſe the *ratio* of 120 to 4 or 30 to 1. is much leſs than that of 27000000 to 90000 or 300 to 1. And therefore upon ſuch Suppoſition it will follow, That the Gravities of ſuch Particles of Mercury, wou'd be much leſs than that of ſuch Particles of Water: And that the Surfaces of theſe Particles of Mercury, wou'd be much larger, in reſpect of their Gravities, than that of the like Particles of Water, in reſpect of their Gravities, and conſequently the Mercury wou'd riſe in the Alembick with much Fewer degrees of Heat, than the Water upon this account. But 2. The

Particles of Mercury are perfectly Spherical and Equal ; (for all Homogeneous Bodys muſt consiſt of Particles *Similes & æquales* in the *Euclidean Senſe Vide Def.* 1. 6. & 9, 11. *Eucli:*) and conſequently can only touch in points, and thereby their Sublimation will become more easie. A Sphere can be touch'd but by 12 other equal Spheres, and that too, but in ſo many Points ; and if we ſuppoſe the Superficial particles of the Mercury to be firſt rais'd in the Alembick, they can be touch'd only by 9 other. Now the Force and Value of ſuch a contact as this of 9 points, is leſs (*Cæteris paribus,*) than that of other ſolid *Bodies* generated by the Circumrotation of what ever Figures Regular or Irregular, Right-lin'd, or Curve-lin'd : *For,* The Contacts of Circles is the Meaſure of the Contacts of all other

Figures whatſoe're ; and tho' in ſome Curves their Contacts in ſome points may be leſs than that of Circles, (*vide Scholium Lem*: 11 *Princip: Phil: Mathem: Newtoni.*) yet in all their other points, they will be Proportionally greater, and conſequently the value of the whole Contacts greater than that of Circles ; wherefore it is evident, that Spherical Bodies will be more eaſily ſeparated than any other, and conſequently will riſe in the Alembick with fewer degrees of Heat than any other. *I Suppoſe*,

2dly. That the only Effect of the Sublimations, and other Preparations of Mercury, is the dividing it into theſe parts of the firſt Compoſition, which are Spherical, *Per ſuppos*: 1. Or into parts of a more complicated Compoſition, which (by reaſon of the vaſt Gravity of Mercury, in reſpect of other Fluids, & the uniform preſſure of the *Medi-*

um.) may be ſtill Spherical. For if the Mercury be pure, and no Heterogeneous lighter Body be mix'd with it, it will ſtill retain its Sphericity till the *ratio* of the Surface of a Particle of Mercury to its Gravity, be to the *ratio* of the Surface of a Particle of Air to its Gravity, as is the ſpecifick Gravity of Mercury to the Specifick Gravity of the Air, *i. e.* (puting the Specifick Gravity of Mercury to that of Air, as m to n; and the Diameter of a Particle of Mercury x, and that of a Particle of Air a.) till $m : n :: \frac{1}{x} : \frac{1}{a}$ Then x will be equal to $\frac{na}{m}$ that is, (ſuppoſing a equal to Unity as the Standard, m to n as 10800 to 1 *proxime.* as all know.) the Diameter of a Particle of Mercury muſt be 10800 times leſs than that of a Particle of Air, or the particles of Mercury them ſelves) 1259712000000 times leſs than theſe of Air, before they loſe their Sphericity. Now beſides theſe diviſions into Spherical Particles, the Saline Bodies which are mix'd with the Mercury in theſe Preparations keep theſe aſunder and disjoin'd like ſo many congeald little Bullets ſeparated by the Fixation of ſome Liquor. This is (as I ſuppoſe) the whole effect of theſe Preparations; as is evident from what Mr. *Boyle* and all other *Chymiſts* have found, to wit, That from all the Tranſmutations, and Preparations of Mercury they cou'd elicite the ſame uniform heavy *F*luid; which cou'd never happen if there were any other (beſides the Now mention'd) effect produç'd by theſe Preparations. *F*or by what means ſoever you diſſolve this congeal'd Separation, the greater Gravity of Mercury brings its *P*articles into their former Union, and thereby reduces them into the ſame Fluid Quickſilver. Beſides theſe two Suppoſitions, it is to be obſerv'd,

1. That the chief Ingredients in *Mercurial* Preparations are (beſides it ſelf) common and Armoniack Salts, & their Spirits, the Spirit & Oyl of *Niter*: *Vitriol*, and its Spirit, and the like (which afterward we ſhall call by the General Name of *Saline Bodies*.) All which (we know) are endued with a vaſt power to vellicat and ſtimulat the more ſenſible parts of Animal Bodies, and (conſequently) to produce Vomitings and Purgeing (of themſelves) according to their Quantity, and the degrees of their Natural force.

2. That the only effect of repeated Sublimations in theſe Preparations, is, the diviſion of the Mercury into ſmaller and ſmaller Particles, and the freeing of theſe from

the Groſſer and more Noxious parts of theſe *Saline Bodies* ; for Mercury ſublimating more quickly and eaſily than theſe other *Saline Bodies*, muſt in repeated Sublimations have a greater proportion to the *Saline* Mixture than in the firſt Sublimations, and conſequently the ſubſequent Sublimations muſt have leſs of thoſe *Saline Bodies* than the *Antecedent*, whereby the Preparation will become ſweeter and leſs vellicating. This is evident from the *aquila alba & panacea Mercurialis*, which are all much heavier (ſpecifically) than any other Preparations of Mercury,

Theſe things premis'd, I come to explain,

II. The manner of the Operation of Mercurial Medicines ; In performing which, I diſtinguiſh two Caſes. 1. Either the Medicine is taken inwardly. Or, 2. It is apply'd ply'd outwardly ; under which head I comprehend both *M*ercurial Inunctions and Plaſterings. As to the 1. After the *M*edicine is taken by the *M*outh, it deſcends into the Stomach, and there the Saline parts of the Compoſition vellicat the *Fibres* thereof, which occaſion theſe Grips are felt upon the taking theſe *M*edicines: And if the Saline Particles have a conſiderable ſhare in the Composition, they ſo powerfully ſtimulat the *Fibres* of the Stomach, as to bring it into theſe Contractions which produce Vomiting, as has been formerly explain'd. The *M*ercury it ſelf, with ſome of the remainder of the Saline Particles ſliping into the *Inteſtines*, do likewiſe vellicat theſe, and occaſion a Gentle Purge ; which Effect, tho' it be conſtant (in the firſt days after taking theſe *M*edicines) yet it is never ſo violent as that of other *Purgatives*; becauſe moſt of it's force is ſpent in the ſtomach. Now that both the Vomiting and *Purging* produc'd by theſe *Medicines* are owing to the ſaline parts of the compoſition, is evident from the nature of *Mercury* and the effect produc'd in it by the Chymical preparations thereof juſt now explain'd: For Mercury conſiſtnig of ſpherical Particles, and by ſuch preparations being only divided into theſe, of themſelves (as being ſpherical) theſe particles cou'd never occasion the ſtimulations, which (as has been formerly ſhown) are neceſſary to produce theſe effects. The only thing they can contribut towards them is, that by their exceſſive gravity & ſmallneſs they are capable to diſſolve the Coheſion of the more viſcuous Fluids of the ſtomach and *Inteſtines* and conſequently make them flow more eaſily, when the *Muſcular Fibres* of theſe parts are otherwiſe brought into contractions. Beſides, we ſee that the forementioned effects, are moſtly produc'd by theſe compoſitions in which moſt of theſe *Saline Bodies* enter. as in the corroſive Sublimat, the White and Yellow Precipitate: But in the others which paſs many Sublimations, (as the Sweet Sublimate, & the *Panacea Mercurialis*) we judge of their goodneſs as they produce leaſt of theſe effects. I aſcribe the Sweating produc'd by a doſe of ſome of theſe compoſitions, partly to the violence of the Vomiting, and partly to the Saline Particles which enter the compoſition, and that ſmall ſalivation, to the Imediat action of theſe *Saline Bodies* upon the Salivary *Glands* and not to the Mercury it ſelf. All theſe will be evident to any who have ſeen the ſudden effects of theſe *Medicines*, which have not had ſufficient time neither to enter nor circulat with the Blood, ſo as to be able to produce the mentioned *Sweating* or ſalivation after the ordinary manner. Thus I have endeavoured to explain the effects of theſe *Medicines* while they are in the *Primæ Viæ.* I ſhall now ſhow the manner of their Operation in producing a *Flux de Bouche*, that thereby the leſſer effects of this kind may be underſtood.

The *Mercury* being free'd (by the action of the ſtomach and the Heat of the Liquors contain'd in the ſame and in the *Inteſtines*) of moſt of the ſaline part of the compoſition, enters the Blood by the *Lacteals*, and is with it carried about through the Canals where either it, or any Liquor (of the Body) generated by it, Flows. (the ſmall remainder of theſe Saline Particles, which adheres to the *Mercury* after the action of the Stomach and *Inteſtines*, aſſiſting the propagation of the motion, by the velicating the ſides of the Canals) And having the ſame Celerity, but a much greater weight, it has conſequently a greater force, and produces a ſtronger *Ictus*, and thereby (when once any conſiderable quantity thereof has enter'd the Blood) it (by it's great force and the ſmallneſs of it's praticles) diſolves the unaturalCohefions of all the Liquors, renders them more Fluid, and active, and likewiſe digs out all the Obſtructions of the impaſſable Canals like ſo many little Bullets, ſhot againſt a mud Wall, every little Bullet breaks down a part till the whole be levelled ; and this it is the more able to perform, both becauſe it is exceeding weighty, and makes therefore a greater & more forceable *Ictus*, & becauſe it's particles are exceeding ſmall,and are therefore to be conſider'd as ſo many exceeding ſharp Wedges or *Cunei*: Beſides by the ſmallneſs of it's Particles it is able to enter into theſe ſlender Canals in which the Blood cannot freely paſs, and thereby to ſcour all the Paſſages be they never ſo ſmall. And that there are Canals through which the Globules of the Blood cannot freely paſs, we are convinc'd from Microſcopial Experiments. Thus all the Liquors of the Body being attenuated, and conſequently their celerity and force rendered greater, and all the Canals ſcour'd, and render'd paſſable, the whole *Glands* of the Body are ſet a work, and throw out the more noxious and leſs Fluid parts of their Liquors (by reaſon the particles of the Mercury either diſſolve, or carry before them all the groſs particles which reſiſt them) and thereby the Perſpiration, Urine, ſalivation, are encraes'd, the quantity of the Fluids leſſen'd, and the whole Body emaciated, til there be nothing left but pure and uſeful Liquors, and clear and paſſable Canals. Thoſe who can only be convinc'd by occular Demonſtration may ſee a kind thereof in *Phil. Tranſ.* for *Jan.* 1700, where *Leuvenhoeck* from Microſcopial Experiments on *Tad poles*, confirms the the main of this Doctrine as to the manner of the taking away Obſtructions.

But there is another Effect of *Mercurial Medicines*, which is noways to be forgotten; for beſides theſe mention'd Effects, it diſtroys that corroſive *Faculty* of the *Liquors* which burſts the ſuperficial Veſſels, and produces theſe conſtant pain, pains, Scabs, Ulcers, and the like, which we feel; For, ſuppoſing an Obſtruction in any Veſſel (either by the corrosiveneſs or Viſcidity of theLiquor,or from ſome extrinſick cauſe) the Liquor Satgnates and Coagulates there,and by the force of the fluent part of thatLiquor, & by the Corroſiveneſs of the ſtagnated part, the Veſſels are *Miſerably* diſtended, and their parts dilacerated, which occasions conſtant pain in that part,or they burſt, and the Liquor putrifying, occaſions a Botch, Scab, or Ulcer, more or leſs Dangerous and painful, as the corrosiveneſs of the ſtagnated and putrifying *F*luid is greater or leſſer. Now this corrosive Faculty muſt proceed from the pointedneſs of the particles (perhaps theſe particles may conſiſt of four equilateralTriangled plains, for ſuch have the greateſt equal degree of acuteneſs on all their points which ſeems neceſſary to make them equable in their Actions, and Homogeneous in their Natures) of the ſtagnated Fluid. Now the *Mercury* will not only remove the Obſtruction, and make the Veſſel paſſable by its weight, but likewiſe by the ſame will break off, and plain the points and Angles of theſe Particles, and ſo render them Harmleſs and innocent; for *Sublata cauſa*, &c.

But here it may be objected, that the grand effect (as moſt People believe] of *Mercurial Medicines* is Salivation, and that really the the Salivary *Glands* ſecern more of their Fluid proportionally than any other, yea than moſt other *Glands* of the Body, which is contrar to the 5. *Prop.* about Secretion. To this I Anſwer,

1. That the principal effect of

Mercury, is the attenuating the Fluids, the clearing the Canals, and the deſtroying the Corroſiveneſs of the Obſtructions, and that ſalivation has no more title to be the principal effect of Mercury, than inſenſible perſpiration: For all the *Glands* (notwithſtanding the Objection) ſecret their reſpective Liquors in the proportion mentioned in *prop.* 5. about *Secretion*. 2. It is evident that ſalivation is not the main effect of Mercury from this, That many perſons are cur'd of very dangerous Poxes, Ulcers, and Rheumrtiſms without ever ſalivating, at leaſt at the ordinary rate of *S*alivation. But 3. The reaſon why we ſeem to ſecern more by the ſalivary *Glands* proportionally than by any or moſt others, are theſe, 1. The ſalivary *Glands* are more in number than any of theſe which ſeparate viſible Fluids;

and conſequently it is but reaſonable they ſhou'd ſecern more than any other. It is true the *Glands* of inſenſible perſpiration are more in number than thoſe, and it is not to be doubted but they they ſecern more likewiſe; and it will be found ſo when ever the thing is examined after *Sanctorius*'s method; but that ſecretion not being viſible, makes the matter doubted 2. The Canals which conſtitute the *Glands* of ſalivation are evidently wider than theſe of others, as is clear from their ſpungy and ſoft Contexture, and ſo it is very accountable from the the mentioned *Prop*: why they ſecern more plentifully. 3. The Fluid ſecern'd in the Salivary *Glands* is Ropy and Viſcid, and one part draws forward another, which does not happen in moſt other *Glands*, and upon this account it is no wonder that thoſe ſecern more than theſe. 4. The Salivary *Glands* in ſome People, have not ſo good a Contexture, and ſo obvious a courſe as in others: And this is the Reaſon why ſome Salivat little or none, and others too much. But 5. The true account of the Matter is this, The *Saliva* being a tough ropy Subſtance, cannot be thruſt out ſo faſt as the Mercury carries it foreward, eſpecially ſeeing it ſeparates only the moſt Glutinous parts of this *Saliva*, whence all the Salivary *Glands* begin to ſwell until there be ſuch a quantity accumulated, as together with the force of the Mercury, and of the ſucceeding Fluid is able to burſt the Orifices of the *Glands*: And is obſervable, the Salivation continues only ſo long as any of the *Glands* are fonnd ſwell'd: Whence it is evident that this plentiful Salivation depends upon this, That the Fluid is as it were laid up in ſtore to be deriv'd more plentifully afterwards, whereas in the other *Glands*, the Fluid being thiner, is ſecern'd as faſt as it is driv'n foreward: And hence it comes to paſs, that we think the *Saliva* ſecern'd, is much greater in Quantity than what is deriv'd from the other *Glands*. If we take in all theſe Conſiderations together, they will account for the plentiful Salivation by Mercury.

2. As to the ſecond Caſe. In Mercurial Incunctions the viſcid Matter, in which the Quick-ſilver is wrought and pounded, ſerves only to keep the ſmall Particles thereof ſeparated and aſunder, and to apply them to the Skin, till by frequent rough Frictions the ſmalleſt Particles of the Mercury are forced through the ſides of the Cuticular *Alteries* into the Blood

and when once they are got thither they are in the Eſtate juſt now Mention'd, aud operate after the manner already explain'd. And indeed this were the ſhorteſt and eaſieſt courſe of raiſing a *Flux de Bouche*, if *Mercury* cou'd be adjuſted to the *Strength* and Conſtitution of the Patient, (for the Quantity of Mercury, which will kill one, will not produce the deſign'd effect of ſalivation in another) by this Method, as exactly as by Adminiſtring it gradually in Doſes, by the *Mouth*. But it cannot be done ſo, and therefore the latter courſe is the more ſafe.

Mercurial Plaiſters apply'd outwardly to heal Scabs, or inveterat Ulcers, operat thus; The Corſive ſaline mixture (if there be any part thereof in the Compoſition,) eats away and corrods the putrid Matter, which ſears up the

Mouths of the Veſſels; ſo that the *Mercurial* Particles get eaſily into them, where they both clear the Veſſel of the Obſtructions, and deſtroy the pointedneſs of the Particles of the Fluid, which two things did concur to make the Ulcer or ſore. If there be no Saline Body in the Application, then the Mercury muſt be forc'd in by *Friction* into the *Maſs* of the Blood to produce the deſign'd effect.

Thus from a few eaſie & evident *Poſtulates*, I have giv'n an intelligible account of the Manner of the Operation, and of the Effects of Mercurial *Medicines*, when the Mercury enters in any Quantity into the maſs of the *Blood*, and from thence it will be eaſily underſtood, that when the quantity is leſs, the Effects will be proportionally leſſer: So that it will be needleſs to explain all the ſeveral degrees thereof by detail. *But* ſeing it is evident from *Leuvenhoeck*'s Obſervations in the laſt mention'd *Phil. Tranſ.* That the force of the Blood is able to waſh away ſome Obſtructions: let us take a groſs eſtimat of the Proportion of the Efficacy of the *Blood* aſsiſted by Mercnry, to the Efficacy of the Blood of it ſelf and unaſiſted to take away Obſtructions. Firſt, Then we muſt consider, if inſtead of the ordinary Liquors there paſs'd nothing but Mercury in the Canals of the Body, the weight of Blood being to that of Mercury, as 1032 to 14593, or as 1 to 13 at leaſt, and their Velocities being the ſame, *Mercury* wou'd at leaſt be 13 times more able to remove the Obſtruction than the Blood of ſelf: *But* it is certain (if the Obſtruction renders the Canal impaſsible,) there can no Particle of the *Mercury*

Mercury get away ; and (when there is any quantity thereof got into the Blood) there are ſtill ſome new Particles thereof comeing up, ſo that after ſome time (they having a greater *Momentum* than the *Globules* of the Blood, and thereby getting through it up to the Obſtruction) we may conſider there will be little or nothing ſave Mercurial Particles at, or near the Obſtruction, driv'n againſt it, by the whole force of the Blood ; So, that as to the Obſtruction it ſelf, it is very near the ſame, as if the whole Canals run Mercury. How-e're, let us take the *Proportion* only as 1 to 10, ſo that upon this account the Blood aſsiſted by any conſiderable quantity of Mercury, will be 10 times more able to remove the Obſtruction than the Blood unaſiſted.

2*ly*. Let us conſider the *Globules* of the Blood are Elaſtick (for they often loſe their *Figure* in ſtrait Canals, and recover it again, as *Leuvenhoeck* has ſhown, which is the Definition of Elaſticity) and theſe of Mercury are not, or very little ſo: And conſequently upon this account, the Efficacy of the *Globules* of Blood will be hugely diminiſh'd, Let us ſuppoſe it looſes $\frac{1}{4}$ of its Efficacy (which is a liberal allowance) and then the Proportion will be $\frac{3}{4}$ to 10, or 3 to 40.

3*ly*. Let uſ obſerve, That the *Globules* of the Blood, and *Mercury* driv'n againſt the Obſtruction and at ev'ry *Pulſe* diging away a a part of the ſame may be conſidered as *Cunei*, now *cæteris paribus*, the *Force* or Efficacy of *Cunei* is reciprocally proportional to the Angles, their Edges make. But in ſpheres the leſſer or greater degree of Curvity, is to be conſider'd as theſe Angles when theſe ſpheres are conſider'd as *Cunei*: And the degrees of Curvity in ſpheres (as in Circles) are reciprocally as their *Radii*. Suppoſing then the Diameter or *Radius* of a Particle of *Mercury* is to that of a *Globule* of Blood, as 1 to 100 (and there can be Reaſons giv'n, ſome of which I have formerly hinted, why the Odds may be ſuppos'd much greater) then the force of the Mercury, and the Blood, to that of the Blood unaſiſted to remove Obſtructions will be as 4000 to 3. Laſtly, let us conſider, that by the force of the *Mercury*, the *Liquors* of the Body are exceedingly attenuated & render'd more moveable, and are thereby capacitated to receive a ſtronger Impreſsion, ſo that they both move more quickly and with greater force, as is evident from the Pulſe of thoſe who are under a *Flux de Bouche* whoſe Pulſe is little leſs frequent and ſtrong, than the Pulſe of thoſe in a Fever. Let us ſuppoſe the Proportion, both of the freqnency of their Pulſe, and of its ſtrength to that of an ordinary one, as 3 to 2. (and this is certainly much leſs than the truth) Then it will be as 3 to 2 upon the account of its greater force, and again as 3 to 2 upon the account of its greater frequency, that is as 9 to 4. So that now upon this laſt, and all the former accounts, the proportion of the Efficacy of the Blood aſſiſted by any conſiderable quantity of *Mercury*, to that of the Blood unaſſiſted, to remove an Obſtruction, will be as 36000 to 12 or as 3000 to 1. So that the firſt will be 3000 times more effectual for that end than the latter. But if any ſhou'd ſtill think we have made too liberal Allowances for the *Mercury*, let us rebate the Proportion one third part: yet ſtill the *B*lood aſsiſted by any conſiderable quantity of Mercury will be able to do as much toward the removeal of an Obſtruction in one day, as the Blood unaſsiſted in three years almoſt.

*B*eſides, there are a great many caſes in which the Blood unaſſiſted, is ſo far from being able to remove the Obſtruction, that it will continually encreaſe the ſame: For if the Obſtruction proceed from a Depravation of the Liquors of the Body as in *Rheumatiſms*, or if ſome corroding matter, be forc'd into the Liquors, ſo as to be able to vitiate the ſame, as in Poxes, Peſts, and Poiſons, it is demonſtrable, that (without ſome external aſsiſtance, either by Diet or *M*edicines) the Malady inſtead of *M*ending by length of time will encreaſe. But if the Obſtruction proceed from ſome external injury, as in *B*ruiſes, Wounds, Colds, and (perhaps all continu'd) *F*evers, the Liquors (ſtill perſiſting in their Natural and Wholeſome Eſtate,) may do much to drive away the ſame by length of time; but ſtill the ſooner, and more ſafely if they be aſsiſted by convenient Medicines. I come to

III. The Advantage and Uſefulneſs of Mercurial Medicines.

And, 1. They are uſeful for deſtroying the Viſcidity and Thickneſs, the Corroſiveneſs and Pointedneſs, of the Particles of the whole Liquors of the Body, rendering them Fluid and moveable, Innocent and Harmleſs, if before they were otherwiſe.

2. They are evidently uſeful for removing all Obſtructions, Ulcers, *S*cabs, Botches, *S*wellings, conſtant Pains. (all which are

but the effects of ſome kind of Obſtruction or other) of what ever Nature or Kind, by adjuſting only their Quantities rightly, but that is the Work of an able Phyſician.

Now for anſwer to the Queſtion which gave occaſion to this Diſcourſe: Mercurial Medicines were exceedingly uſeful and wou'd anſwer the whole deſign in Cureing Fevers, were it not upon theſe two accounts. 1. *Before* they cou'd be effectual for this purpoſe, they behoov'd to be adminiſtred to a large quantity, which never miſſes (by the violence and force of the *Motion* of the *Blood* thereby occaſion'd) to induce a new Fever in the Patient of it ſelf, ſo that inſtead of Cureing the former *Fever*, it wou'd double it, and make the danger double, which by no means is to be done:thePatient having enough a do to wreſtle with one. But 2. It requires ſo long time to bring the effects of *Mercurial* Remedies to any height, that the Patient (in ſo long a ſpace) woud be Cur'd by the force of Nature, or kill'd by the Violence of the Diſeaſe, ſo that upon this account they are rendred uſeleſs. Beſides there are a Thouſand other Inconvencies which render this *Method* in its full force, altogether impracticable.

After all, I mind to have been inform'd (ſome time ago) by that Eminent Phyſician of our Countrey, (whom I have thrice already mention'd) That People who have been ſeverly fluxd ſeldom fall into dangerous Fevers, and that in Fevers of Children occaſion'd by Worms, *Mercury* (if diſcreetly us'd (is alwiſe,)and in ſomeFevers of People of riper years, is often very ſucceſsful. The Reaſon of both which is very evident from our Doctrine.

For (in thoſe who have been ſeverely Flux'd) the Blood is ſo purify'd, and render'd ſo Fluid, and all the Canals are ſo cleans'd and ſcour'd, that if at any time there ſhou'd happen ſuch Obſtructions as occasion Fevers, Nature is able in a ſhort time to drive them away, ſeing they muſt rather happen from ſome external cauſe, than from within, where all is clear and paſſable.

As for Fevers occaſion'd by Worms among the Fluids in the Bodies of young Perſons. (which by the way is an Argument omitted for our Theory of continu'd Fevers, as is likewiſe the *Febris Variolarum*, both which are occaſion'd by Obſtructions, as is evident from the botches which break out npon the latter, and as ſhall be juſt now ſhown of the tormer) For here a little Worm being forc'd into ſome of the capillary *Arteries*, where it can neither get back nor foreward, totally occludes the paſſage of the Blood, and thereby occasions a Fever after the manner already explain'd. Now the Reaſon why the natural force of the Blood is not able to remove ſuch an Obſtruction is, becauſe a living Creature makes it, which will not be mouldred away after the manner of coagulated Blood ; But will require the greater weight and force the Mercury to kill it firſt, and then both the *Mercury* and Blood concuring, waſh it away.

FINIS.

THE APPLICATION TO THE General Propoſition TO HECTICK FEVERS.

Having in the former part of theſe Papers, treated Continued Fevers ſo, as to comprehend the general Symptoms which are common to each kind; ſhewing how the common Appearances of each may be accounted for, from an Obſtruction of the Canals which conſtitute the Glands, and thereby an Augmentation of quantity of the blood in the paſſable ones; and how all the Changes of the motion and the qualities of the blood neceſſary toward a true Theory of Hot Fevers, did naturally follow from thence; ſo that the general Doctrine may eaſily be apply'd to all the Varieties of Continued Acute Fevers. I ſhall now endeavour to ſhew, How the Appearances of Slow Conſumptive Fevers in general, and of *Hectick Fevers* in particular, may be deduc'd from the other part of the general Propoſition; *viz.* from a Dilatation of the Conſtituent Veſſels of the Glands: In order to which, I premiſe the following

Lemma III.

Cæteris Paribus, The Strengths of different Animals of the ſame Species, or of the ſame Animal at different times, are in a Triplicate Proportion of the Quantities of the Maſs of their Blood.

Demonſtration.

It is evident from the Animal Oeconomy, that the Augmentation or Encreaſe, not only of all the Fluids, but likewiſe of all the Solid Parts of the Body, is owing to the Blood, and that the ſame (all other things being equal) is proportional to the quantity thereof; and it is certain, from infallible Experiments, that (whatever be the cauſe of Muſcular Motion) the blood it ſelf, the *Liquidum Nervorum*, and the Muſcles, (*i. e.* a Bundle of Muſcular Fibres, and the Integrity of the ſame) are only and abſolutely neceſſary to the action of the ſaid Muſcles; for, put any two of theſe, and entirely take away the third, no Motion will follow: Wherefore, the forces of any one, or of all the Voluntary Muſcles, *i. e.* the ſtrengths of Animals are in a Compound Proportion of all theſe Three. But the quantity of each of theſe three, in this caſe, depends upon, and is in Proportion to the Quantity of the Maſs of the Blood, as has been juſt now ſhewn: And therefore the ſtrengths of different

Animals of the ſame Species, or &c. *q. e. d.*

Scholium.

It is not ſo eaſie to compare the ſtrengths of different Animals of the ſame Species, as to compare the ſtrengths of the ſame Animal at different times; for in the firſt caſe, before the foreſaid *Lemma* can obtain, it is neceſſary they be of the ſame Age, Stature, Diſpoſition and Conſtitution, all which conditions are hardly found, or made evident to be ſo: But in the latter, it is neceſſary only, that the Animal gently and inſenſibly encreaſe or decay, as in the ſame Animal, Young and Old, and betwixt the two. But whether in the ſame, or different Animals, if theſe Conditions were equal, it were eaſie to determin the Proportion of their ſtrengths; for then, opening the ſame Vein or Arterie in both, making (as near as may be) the ſame Orifice and Ligature in the ſame place of the Vein or Arterie; obſerve the quantities of Blood emitted at the ſame time. The wholes of the Maſſes of their Blood ſhall be as the quantities emitted, and conſequently their ſtrengths in a Triplicate Proportion of theſe.

Corollary.

Hence the reaſon is evident of the diſproportion of the ſtrengths of the ſame perſon, a Boy, an Old Man, in the mean betwixt the two, and in a Fever; altho' the odds betwixt the quantities of his Blood, at theſe different Seaſons, be not ſo great; for, let the quantities of his Blood in the ſame order I have nam'd them, be 10, 15, 20, 30 Pounds, *i. e.* their Proportions, 2, 3, 4, 6. his ſtrengths ſhall be in theſe Proportions, 8, 27, 64, 216; how this Proportion ſomewhat abated, ſerves to account for the weakneſs of Hectick People, ſhall be afterward ſhewn.

Propoſition.

The general and moſt effectual Cauſe of Hectick Fevers, is a Dilatation of the conſtituent Veſſels of the Glands, or (to expreſs it more Univerſally, as it may be done in the other particular Propoſition) of the Conduits of Secretion.

Suppoſing a Dilatation of the Conduits of Secretion, it will follow as a Corollary, that the quantity of all the Fluids of the body may be ſuppos'd thereby diminiſh'd in any given Proportion of Minority to the whole of theſe: For, from the ſaid Dilatation ſuppos'd, there will follow a greater Velocity of the Fluids contain'd in the Canals of the Body, as ſhall be afterward demonſtrated: And ſince, by the 5th Propoſition about Secretion, the quantity ſeparated, is in a Compounded Proportion of the Velocity of the Fluid, and of the Orifice; both theſe being Augmented, the quantity of the Separation muſt be Proportionally augmented, and conſequently, the quantity of the remaining Fluids Proportionally diminiſh'd; ſo that meerly upon this account, when a perſon falls into a *Hectick* Fever, we may ſuppoſe the quantity of his Blood (becauſe it is from the reſt of the Fluids which we are ſpeaking of, generated) to be conſiderbly abated: Let us ſuppoſe him from 20 Pounds in his ordinary State, to have dwindl'd into 16, then, by *Lemma Primum*, and its *Scholium*, $\frac{aa}{a+6}$ = 12 Pounds in caſe of a Subduple Dilatation; and $\frac{aa}{a+6}$ = $12\frac{4}{5}$ Pounds, in caſe of a Subtriple one, *i. e.* if there be (upon the foreſaid account) ſuppos'd but 16 Pounds of Blood in a Hectick Perſon, as the *Media Quantitas*, and that to the Cylindrical Canals (equal to the whole Veſſels of the Body, ſave the Inteſtines and Lacteals) there be added another, whoſe Orifice is equal to one half of the former (*i. e.* if the Veſſels be dilated in their Orifices one half) then the Quantity of 16 Pounds of Blood in theſe ſo dilated Veſſels, ſhall be but like 12 Pounds in theſe Veſſels if they had not been dilated, and produce but ſuch effects, as ſuch a quantity wou'd do in the Canals, if they were in their ordinary State; and ſo in other Dilatations. From both theſe conſiderations it's clear, we may ſuppoſe the quantity of all Fluids of Hectick People abated at any requir'd rate of Minority.

Come we now to ſolve the appearances of Hectick Fevers. From the Dilatation of the Conduits of Secretion, and the Diminution of the quantity of all the Fluids, and of the Blood eſpecially, it follows,

§. 1. That the Velocity of the Blood will be greater, and conſequently the Pulſe more frequent and quicker. The taking away an *Impedimentum* from one ſide, is Equivalent to (the Circumſtances continuing the ſame as formerly,) the adding an equal *Momentum* on the other: Wherefore, if I ſhew that the *Impedimenta* to the Motion of the Blood, are (by theſe) taken away, it muſt follow, that the Motion and Velocity thereof muſt be Augmented. This I ſhall do in theſe three particulars, I. It is certain that one great Reſiſtance to the Motion of the Blood, at the Heart, or in the Arteries, is the precedent Blood in the Arteries, continu'd through the Veins to the Heart, and Arteries again; for the preceeding Blood always hinders the ſucceeding, ſeeing, before the one ſucceed in it's place, the other muſt be remov'd: And this Reſiſtance is always Proportional to the quantity of the Maſs of the whole Blood; but the quantity of the Blood being diminiſh'd, this *Impedimentum* muſt be proportionally diminiſh'd, and conſequently the Velocity of the reſt, greater. This we evidently perceive in the time of Blood-letting. II. Another principal Reſiſtance of the Motion of the Blood, is the ſtriking of the Particles of the ſame againſt the ſides of theſe Veſſels, eſpecially Conical ones; now the Dilatation of theſe Veſſels will much leſſen this Reſiſtance, upon theſe three Accounts. 1. The Veſſels being dilated, the Cylinder, whoſe Baſe is the Perpendicular Section through the Axe of the narroweſt Paſſage of the Canal, will thereby be augmented, and conſequently many more Particles than otherwiſe, get free, without ſtriking againſt the ſides of Canals. 2. Thoſe who do not ſtrike, are remov'd to a greater diſtance from the ſides of the Canal, *i. e.* their Motion is quicker; for in this caſe, the ſides of the Veſſel are as *Fulcra*, and the greater Diſtances, as longer *Vectes*, and conſequently the Celerity as theſe *Vectes*. 3. The Surfaces of little things have a greater Proportion to their Bulks or Solidities, than thoſe of greater things to theirs; and therefore the internal Surface of a ſmaller Veſſel, will be greater in reſpect of its contain'd Fluid, than thoſe of a greater Veſſel in reſpect of its, and conſequently againſt the Internal Surface of this dilated Canal, fewer Particles of the blood will ſtrike, than againſt the ſame when it was Narrower. III. A Third Reſiſtance to the blood, is the Preſſure of the Circumambient Muſcles, Bones, Tendons, and diſtended Canals, which do ſurround the Arteries (many of them) on every ſide, and drive the ſides thereof inward: Now this is entirely taken away, by the Emaciation and Conſumption of theſe Solid Parts which always preceed Hectick Fevers. And IV. Beſides all theſe, the Velocity of the Blood muſt be encreas'd; becauſe (as ſhall be juſt now ſhewn) it is dryer, hotter, and more ſaltiſh than ordinary, and conſequently it will (by the ſtimulating quality following upon theſe) bring the Heart into more frequent Contractions, and encreaſe the Propagation of the Blood in the Arteries. Now, from all theſe, it being evident, that the Velocity of the Blood is greater, it follows: 1. That the Pulſe muſt be more frequent; for the Heart being an Involuntary Muſcle, its conſtant motion, muſt, and does depend upon the Influx of the *Liquidum Nervorum*, forc'd into it by the Arteries running upon the Nerves in the Brain; every beating of the Artery, forcing the *Liquidum* into the Muſcle of the Heart, whereby it contracts, and the Velocity of the Blood being greater, this Influx muſt be more frequent, *i. e.* The Heart muſt Contract oftener, and the Arteries likewiſe; for the Contraction of the Heart, and the frequency of the Pulſe, is always Proportional to the Velocity of the Blood. II. It muſt be quicker, becauſe by the great Velocity of the Blood, it ſtays but a ſhort time in the expulſions of the Artery outward, *i. e.* it does not continue any long time forcing the Artery againſt the apply'd Fingers.

§. 2. Tho' the Pulſe be freqnent and quick, yet it muſt be weak; this is evident upon theſe two accounts. I. The quantity of the Blood being ſmall, the Arteries not being Diſtended therewith, cannot be driv'n ſo far outwardly as ordinarily; and the *Ictus* of all Unbending Springy Bodies, *Cæteris Paribus*, being Proportional to the degrees of their being bended, the Arteries by this defect of blood being leſs Bended or Contracted than ordinary, muſt ſtrike more weakly againſt the apply'd Fingers. II. The Arteries not being ſo much Bended as ordinarily, muſt likewiſe ſtrike forceably upon the Nerves running by them, and therefore a leſs quantity of the *Liquidum Nervorum* will be forc'd into the Heart, and conſequently the Heart contract leſs forceably, *i. e.* the Pulſes muſt be left weaker.

§. 3. The Blood muſt be Dryer, more Groſs, and more Saltiſh than ordinary; for the Canals being Wider *ex Hypotheſi.* and the Velocity of the Blood greater *per* §. I. The Evacuations muſt be Proportionally greater *per Prop.* 5. *de Secretione*, and ſeeing *per ejuſdem*, 3. the parts of leaſt Coheſion and greateſt Fluidity, *i. e.* The Thineſt, moſt Humid and Aqueous parts are firſt ſecern'd, and moſt eaſily; therefore the Dryer and groſſer Parts will be laſt ſecern'd; *i. e.* the remaining quantity of the Blood will be dryer or leſs humid, groſſer or leſs thin, and conſequently leſs ſaltiſh.

§. 4. There muſt be felt ſomewhat a greater Heat than ordinary, eſpecially about the Arteries and Hypochondres. There muſt be a greater Heat than ordinary, felt over the whole Body for theſe reaſons. 1. The Blood has greater Room in the Canals (they being ſuppos'd Dilated) and conſeqnently the Heat will have more Liberty, and not be ſo much Pent up as ordinarily; and therefore it muſt break out more plentifully from the Particles of the Blood comminuted by the greater Velocity thereof. 2. Suppoſing no greater heat than ordinary in the body, yet it will be felt greater, becauſe (the conduits of Secretion being dilated) the Heat which is in the Body has a freer Egreſs outward, and muſt Stream out more abundantly upon any thing which touches the Skin of the Hectick Perſon. 3. The Blood is more dry and Saltiſh than ordinary *per* §. 3. And therefore upon this account there will be felt a greater Heat. This Heat is greater about the Arteries, becauſe the Celerity of the Blood there being greateſt, muſt there moſt Plentifully diſentangle the Heat from the Particles of the Blood wherein it's Lodg'd, and greateſt in the right *Hypochondre*, .becauſe there moſt of the Liver is ſituated (which is the Laboratory of the Bile) which ſecerning commonly a hot ſaline Fluid muſt be much more ſo now; likewiſe betwixt both *Hypochonders*, are the Spleen and Pancreas plac'd, in which on this occaſion a more than ordinary Heat, may many ways happen. This Heat whether Univerſal,or Particular,is ſcarcely ever felt by the Patient,both becauſe it is a great deal more moderate than that of Acute Continued Fevers, and becauſe a long Habit and Cuſtom has made it inſenſible, as they do in all other things.

§. 5 The reaſon of the encreaſe of the frequency of the Pulſe, and of the Heat after eating is eaſie from theſe reaſons, 1. Becauſe there is a greater plenty of the *Liquidum Nervorum* generated,which will make the Heart contract more frequently, *i. e.* will make the Pulſes quicker: And 2. Becauſe the Chyle entring into the Maſs of the Blood, will be immediately (becauſe of the Velocity of the Blood) divided into Minute parts, and the Heat thereby diſengaged, *i. e.* the Body will be hotter *per* §. 4. And both theſe effects will continue as long as any of the effects of the repaſt remains.

§. 6. The vaſt decreaſe of ſtrength is evident from *Lemma* 3. It is true indeed, the encreaſe of the Velocity of the Blood demonſtrated, §. 1. will ſomewhat abate the Propoportion there giv'n; but we muſt conſider, tho' the Celerity of it be conſiderably great, yet the quantity thrown into any determin'd part of the Body at one Contraction of the Heart (which is all that is here uſeful) is very ſmall: Beſides, there is a great Difference betwixt the Motion of the Voluntary Muſcles (which is the proper eſtimate of ſtrength) and that of the Involuntary ones, ſuch as the Heart; for the Pulſe may be very quick, from ſuch Reaſons as I have ſhewn § 1. and yet the Patient very weak; ſo that from theſe it is clear, that there is no great occaſion for abating any thing of the foreſaid Propoſition; however, giving as much as may be required, ſtill there is ſufficient in this *Lemma* to ſatisfie this appearance.

§. 7. From this decreaſe of ſtrength *i. e.* weakneſs, it is clear, why perſons labouring under a Hectick Fever, are unwieldy, unactive, and as it were, Sluggiſh.

§. 8. The Urine of Hectick People has the ordinary Colour, but is greater in quantity in Proportion to their Drinking *per* 3 and 4 *Prop. De Secret*.

§ 9 Laſtly, It is evident from what has been ſaid, that if theſe Symptoms be not remov'd, they will neceſſarily encreaſe, even into thoſe Heights which they call the Second and Third Degrees of theſe Fevers, till they end in an intire Extenuation and Inevitable Death. This needs no proof.

I. Thus, from the Suppoſition of a Dilatation of the Conduits of Secretion I have accounted for all the appearances of this kind of Fevers, which is one Argument for the Verity of our Doctrine.

II. From the ſame ſuppos'd Dilatation, I have ſhewn how the Blood will neceſſarily become hotter and dryer, which are all the *Data Bellini* requires to account for theſe Fevers, which is another Argument.

III. The Antecedents of Hectick Fevers, ſuch as are Violent Evacuations by Urine, Stool or Sweat, *&c.* *Ulcers* in the *Throat*, *Lungs*, *Kidneys*, *Womb*, &c. A hot and dry Diſpoſition, precedent long continued Acute Fevers, Drunkenneſs, Madneſs, *&c.* In ſhort, ev'ry thing that conſumes the Humidity of the Fluid or Solid Parts; I ſay, all theſe produce a Dilatation of the Veſſels theſe two ways, 1. They ſpend and conſume the Solid Parts, by withdrawing their Humidity, ſo that theſe ſhrink in and contract, and conſequently do not preſs ſo much upon the ſurrounded Canals, and thereby they have Freedom to be dilated, as far as the force of the contain'd Fluids can diſtract them, or as they Naturally of themſelves will unbend; for the Canals are forceably contracted (by the Muſcle of the Heart and their own Muſcular Fibres) but Naturally, and of themſelves, they widen and unbend. Now, tho' the violent Evacuation be but in one particular place of the Body, yet by the *Æqulibrium* which is kept in the internal Fluids of the Body, as well as the external ones, all the others will ſuffer by it; for all, or moſt of the Fluids of the Body will be drawn toward that place, till the conſuming Part be brought into an equal condition (as to Augmentation or Nouriſhment, over and above what is violently expended) with the reſt, and therefore all the Parts will conſume equally. 2. The Solid ſurrounding Parts thus giving way, the Canals will Naturally unbend themſelves, and will be aſſiſted thereto, by the force of the Fluids therein contain'd: And generally we obſerve Night Sweatings immediately to precede ſuch Fevers, which effectually opens moſt of the conduits. Thus both theſe ways the Couduits of Secretion are dilated, by the Antecedents of Hectick Fevers, which is not an Argument for, but a Demonſtration of the Verity of our Theory.

4. A Fourth Argument, is from the general Principle and Foundation

of the Cure of ſuch Fevers, for (taking firſt away the occaſion of the Diſtemper if they be Symptomical, that nothing may remain but the Simple Hectick) they are always Cured by ſuch things (which being eaſily Digeſted, and Suited to the weakneſs of the Stomach of the Patient, made ſo by this Malady) as do moſt Augment the Solid Parts, and Conſequently ſtraten and contract the Canals again.

5. Laſtly, the appearances upon the opening of ſuch Perſons as are Cut off by Hecticks, do evidently confirm our Doctrine, for beſides other things (as Ulcers, Gangreens and the like) we ſtill obſerve large lank Canals, big Veſſels, ſlender Muſcles, and little Blood.

Much more might be added on the Head, but theſe are ſufficient, elſe twice ſo much will not ſuffice.

A General Method, for examining the Quantity of the Augmentation, or Diminution of the Maſs of Blood, ariſing from an Obſtruction or Dilatation of the Conduits of Secretion.

FOr avoiding Confuſion in the following Calculation and Diſcourſe, I ſhall only name the Effects of an Obſtruction, becauſe any one who pleaſes, may eaſily with the help of the immediately preceeding Part of theſe Papers, apply the ſame method of reaſoning *Mutatis Mutandis*, to a Dilatation of theſe Conduits, the firſt being contrary almoſt in every thing (here eſpecially mention'd) to the latter.

That all continu'd Acute Fevers are produc'd by the Obſtruction of the Conduits of Secretion, is ſo very evident, that none who obſerves, that any long continued Retention of theſe things, which are uſually, and in an Healthful ſtate, ejected out of the Body, (which is infallibly occaſion'd by an Obſtruction of theſe paſſages through which they ought to come) never miſſes to produce a Fever, more or leſs violent, can be ignorant of the ſame. Now the primary and immediate Effect of ſuch Obſtructions, is the Augmentation of the Maſs of the Blood; becauſe every thing ejected out of the Body (the Fæces only excepted) is deriv'd from the Blood, therefore the quantity of the Blood will be Augmented, by ſo much as is the quantity of that which ought to be ejected. Theſe Obſtructions Augment the quantity of the Maſs of the Blood, theſe two ways. 1. By keeping within the Body thoſe Parts of the Blood, which Naturally are ejected: Suppoſe the paſſages of Perſpiration and Urine were obſtructed for one Day, in which a Man ſhould take his ordinary Refection, certainly, the Maſs of the Blood would be Augmented, by ſo much as is the Sum of the Quantities, commonly Evacuated by Perſpiratiou and Urine in one Day, and that too by ſuch a quantity of things, of ſuch an ill Quality, as Nature does not think them fit to be lodg'd in theBody of of an healthful Perſon. If one ſhou'd take his ordinary quantity of Meat and Drink for ſome Days, and theſe Obſtructions continue, the Maſs of the Blood wou'd be encreas'd by ſuch a quantity of vitious matter, as is the Sum of both theſe dayly Evacuations, multiply'd into the Number of days, the Obſtruction continues. But let us ſuppoſe, that the firſt Days Retention of this Vitious Matter, does ſomewhat indiſpoſe the Patient, ſo that he will not be able to Eat or Drink ſo much the next Day; let his next Days Repaſt have any giv'n Proportion to, or be different from the former DaysRepaſt,by any giv'n quantity, and let theſe Obſtructions, and this *Ratio*, or Difference, continue for any Number of Days, the Maſs of Blood will be Augmented by a vaſt Quantity of vitious Matter: How to find the Sum thereof, I ſhall preſently ſhew. It is true indeed, Nature (by the *Æquilibrium* generally kept in the Fluids of the Body) has wiſely provided that the

Diminution or Suppreſſion of one Evacuation, ſhou'd be the Augmentation of another, elſe we cou'd not continue well one Day to an end: But it is likewiſe true, that this is not always ſo, at leaſt not intirely; which is ſufficient to our purpoſe, and therefore, when ever this caſe happens, it muſt infallibly augment the Maſs of the Blood. But 2. not only is the Blood by this Retention augmented, but a great many of the ordinary Paſſages being obſtructed, occaſions the Blood only to flow in the paſſable ones, whereby it is ſo accumulated there, as to augment the Quantity thereof, in the paſſable ones to a huge degree. But having already in the firſt *Lemma*, and its *Scholium*, ſufficiently conſider'd the Augmentation ariſing from this conſideration, I ſhall now ſhew how to Calculate the Encreaſe ariſing from the former.

I. Let *r* to *s* repreſent the *Ratio* of an ordinary Man's Eating and Drinking in one Day, to his Evacuations more or fewer in the ſame; let *a* repreſent the ordinary quantity a Man Eats and Drinks in one Day, *x* the difference of his Eating and Drinking one Day from another, upon the occaſion of an indiſpoſition ariſing from any obſtruction, or retention of the uſual Evacuations; and let this difference be conſtant for ſome Days, y the Number of Days in which he takes any Refection at all; then the Quantity of Vitious Matter by which the Maſs of the Blood is augmented, ſhall be

$$= \frac{2asy + sxy - sxy^2}{2r}$$

2. If from the difference of his Dayly Eating and Drinking giv'n, you wou'd deſire the Number of Days in which this Retention ſhou'd amount to any giv'n Quantity; ſuppoſe c, then you may have it from the Solution of this Æquation $y^2 = \frac{x+2a}{x} y - \frac{2cr}{sx}$ Wherein x is giv'n from y, and y from x.

3. Suppoſing the ſame quantities continue as they are, only with this difference, that a Man Eat and Drink leſs ev'ry day at a certain Rate, and not in a giv'n difference, *i. e.* the decreaſe of his refection being formerly in an Arithmetick Progreſſion, let it be now in a Geo-

metrick one; let the *Ratio* of this laſt Progreſſion be *m* to *n*, or $\frac{m}{n} = x$; Then the Quantity of Vitious Matter, by which the Blood is augmented in this Caſe,

is $= \frac{a^2 s x^{y+1} - a^2 s x}{a r x^{y+1} - a r x^y}$; Where *y* or $y+1$ is the exponent of *x*.

4. If you deſire this quantity to be equal to *c*, as in the former Caſe, then the Solution of this Æquation

$$x^y = \frac{adr}{adr + a^2 s} x^{y+1} - \frac{a^2 s}{adr + a^2 s}$$

will give *x* or *y* from either of them ſuppos'd known; If you deſire *x* from *y* giv'n, you muſt ſolve an Æquation denominated by *y*; if from *x* giv'n, you want *y*, you ſhall have it by a Table of Logarithms; for, put *l* to ſignifie the Logarithm of any Quantity,

Y=

$$Y = l.\ x)\ l.\ \frac{adsx}{a^2sx - adrx}$$ That is the one Logarithm divided by the other.

5. If you wou'd have the full Effects of theſe Augmentations, you muſt add theſe found out in the Firſt and Third Steps to the natural mean Quantity of the Blood, *viz:* 20 Pounds, and then apply the Æquation found out in the firſt *Lemma*; calling the Sum of both theſe quantities *a*. Thus let the 20 Pounds of Blood ordinarily found in a Man, together with the Augmentations (found in the Firſt and Third Steps) by reaſon of the Retention of the ordinary Evacuations be called *a*, then *per Lemma* 1. the True value of the whole Maſs of the Blood, in reſpect of the paſſable Canals, ſhall be

$$= \frac{a^2}{a - 6}$$

6. If you deſire this quantity ſhou'd be equal to a giv'n one c, then $6 = \frac{aa - ac}{c}$ and $a - b = -\frac{az}{c}$ which are all the poſſible Varieties of theſe Caſes. The ſame, with the greateſt eaſe imaginable, may be apply'd to a Dilatation.

The Application of the general Calculations to ſome particular Caſes.

We all know, that in a Continned Hot Fever, the Perſpiration is almoſt or altogether ſuppreſs'd, not only ſome time before, but very often, during the whole time of its Period. And *Sanctorius* in the 6th Aphoriſm of his 1ſt Sect. ſays, That if the Meat or Drink taken in one Day, amount to 8 Pounds, the inſenſible Perſpiartion will be 5 Pounds: Hence the proportion of the dayly Repaſt to the Perſpiration, is as 8 to 5, and the quantity taken by the Mouth is 8 Pounds. Let us ſuppoſe he takes 6 Pounds of Meat and Drink the next Day, the Third, 4 Pounds, and the Fourth, 2, and on the Fifth he falls Sick of a Fever, then by the firſt Step of the general Calculation, the Maſs of the Blood will be Augmented by $12\frac{1}{2}$ Pounds of Vitious Matter; and if in the Second Step of the ſame, we put $c = 12\frac{1}{2}$, then is $y = 4$, $x = 2$. But if we ſuppoſe the dayly Repaſt to decreaſe in a Geometical Proportrion, as 2 to 1. continuing the reſt of the *Data* the ſame as formerly, by the Third Step of the ſame, the Blood will be Augmented by 10 Pounds; and if in the Fourth Step we put $c = 10$, then will be $x = 2$, $y = 4$. Likewiſe, if we joyn theſe laſt 10 Pounds of Augmentation, to the ordinary quantity of Blood found in a Man, then they will make up 30 Pounds; and if we ſuppoſe a Subduple Dilatation of the Veſſels, then the true value of the quantity of the Blood, in reſpect of the paſſable Canals, ſhall be 45 Pounds; if a Subtriple, 40 Pounds; if but a Subdecuple, then the Maſs of the Blood will be at leaſt 33 Pounds, by the 5th ſtep of the general Calculation: And if in the laſt Step, we put $c = 4$, then ſhall be $b = 7\frac{1}{2}$, $a - b = 22\frac{1}{2}$.

From all theſe Calculations, it is evident, that if the Augmentation of the quantity of the Maſs of the Blood, to any aſſigaaſſignable quantity, can produce a Fever, here it may be had; for if a Man naturally Eats and Drinks but little, or if but a ſmall Part of the Perſpiration be obſtructed, yet ſtill the Augmentation of the Blood may amount to the aſſignable quantity, if we put but leſſer quantities for x, and greater for y, *i. e.* The difference of his dayly Repaſts ſhall be leſs, or the time, e're he falls ſick, longer.

2. If the Urine be ſuppreſs'd, either by a Stone, Ulcer, or Caruncle in the Kidneys, Ureter, Neck of the Bladder, or Urethra; or by any other cauſe, in any other Place about the Organs of Secretion of Urine, and that for any conſiderable time, the Perſon will infallibly be ſeiz'd by a Fever more or leſs violent; and tho' this, Fever may be partly aſcrib'd to the violent pain which follows upon ſuch Obſtructions, from ſuch Cauſes, yet it is not to be doubted, but it is moſtly occaſion'd by the Augmentation of the Maſs of the Blood, by ſuch a quantity of Vitious Matter, as neceſſarily muſt be accumulated by ſuch a Suppreſſion: And

that we may underſtand how great this Quantity may be, let us conſider that *Sanctorius* in the 59th Aphor. of the 1ſt Sect. ſays, That the Perſpiration is to the Quantity voided by Urine in a giv'n time, as 40 to 16. Wherefore from this, and the formerly cited Aphoriſm, *viz.* 6th. it follows, That the daily Repaſt, or the Quantity voided by the Mouth, is to the Quantity voided by the Urethra, as 8 to 2. Suppoſe then a Man, who has a Suppreſſion of Urine for 8 Days, takes in by the Mouth every Day a Pound leſs, beginning at 8 ; then by the firſt Step of the general Calculation, the Blood ſhall be augmented by 9 Pounds of Vitious Matter. It is eaſie to apply the reſt of the Steps of the general Calculation from theſe *Data* to this Caſe, and therefore I ſhall not trouble my Reader with them : Only it may be ask'd, ſince the Suppreſſion of the Urine encreaſes the Quantity of the Blood, and thereby cauſes a Fever, Why, when a Man Drinks a vaſt quantity of ſtrong Liquor, he is not thereby thrown into one immediately? To this I Anſwer.

1. That many of the Symptoms common to hot Fevers, are very frequently obſerv'd in perſons who are Drunk, which is a great confirmation of our Doctrine; and that real Fevers do very often ſucceed violent Fits of Drunkenneſs, eſpecially if the perſon get much Cold after them, whereby the Glands, contiguous to the Air, are obſtructed. But 2. The Reaſon why exceſſive Drinking does not always and immediately throw a perſon into a Fever, is, that in the time, or after the Drinking, there is a vaſt Secretion by Urine. And how great a Quantity this may be, we ſhall examine thus: From what was before cited from *Sanctorius*, it is evident, a Man in a Day, or 24 Hours, voids by Urine 2 Pound or 32 Ounces, *i. e.* there are two Pounds of Urine, ſecernible from

20 Pounds of Blood in a Day, or (taking one Hour with another) the mean quantity Secernible from 20 Pounds of Blood, is about $1\frac{1}{3}$ Ounce in an Hour: Now ſuppoſe a Man has drank 6 Pounds of a moderately ſtrong Liquor, all theſe 6 Pounds except a very ſmall quantity are Secernible Serum; wherefore, as 2 Pounds of Secernible Serum to $1\frac{1}{3}$ Ounce commonly Secern'd in an Hour, ſo is 8 Pounds to $5\frac{1}{2}$ Ounces, which upon this conſideration will be Secern'd in one Hour. But we generally obſerve the Pulſes of Drunken People to go faſter, and with greater force, than when Sober, and that at a very extraordinary rate, inſomuch, that we may, modeſtly ſpeaking, ſay, they go twice as faſt, and with twice as great force; wherefore, upon this Conſideration, the former quantity

muſt be multiplied by 4, that is, he will paſs by Urine about 20 Ounces at leaſt in an Hour; and tho' he doth not Secern ſo much ev'ry Hour, yet from this Calculation in the general, we may ſee that in 7 or 8 Hours, the moſt part of the ſaid Liquor will be voided. Add to theſe, that the Perſpiration will be Augmented at the ſame rate, ſo that from both theſe Conſiderations, it is evident, why much Drinking does not always, and immediately, caſt Men into Fevers.

3. There are few who are Ignorant of the fatal effects of a long continu'd Suppreſſion of the Menſtrual Blood, in Young Vigorous Women: But among all theſe there are none more dangerous than the Acute continu'd Fevers; which it often begets, this it can only do by Augmenting the quantity of

the Maſs of the Blood; and how much that may be, we ſhall now examine: It is very well known that the Principal Uſe of this Blood, is for the Nouriſhment of the *Fœtus*, both when it is in the Belly, and on the Breaſts; and that very little beſides this, is employ'd, or is neceſſary to that purpoſe, will be evident, to any one, who conſiders that Nature uſes always the moſt Simple, Direct, and Uncompounded Means for obtaining her ends; and never employs many, where one might be made ſufficient, and therefore wou'd never ordain the Suppreſſion of this Matter, the whole time from the Conception, till the Weaning of the Child, and the regular Evacuation of the ſame at other times, if it were not mainly, and only neceſſary for this purpoſe. Now *Bellini*,

lini, in his Treatiſe *de Motu Cordis*, Prop. 4. aſſigns 12 Pounds to be a mean weight to a Humane *Fœtus*, at the time of its Excluſion, ſome weighing twice as much: And therefore, in the ſuppreſſion of the Menſtrual Blood in young Healthy Women, the quantity of the Augmentation of the Maſs of the Blood, will not be under 21 Ounces ev'ry Month; let us take but a Pound, or 16 Ounces, yet it is evident, (if no other Evacuation be encreas'd, and if the Woman be not Naturally very Lean, and Deſtitute of Plenty of Blood) that this in a few Mouths, will Augment the Blood to ſuch a quantity, as is able to produce a Fever, if any aſſignable quantity can do it.

4. Laſtly, as to the effects of a violent and long continu'd Coſtive-

neſs toward a Fever; it muſt be granted, that the *Fæces* do not come from the Blood, and conſequently cannot by their retention Augment the quantity of the ſame: But it is likewiſe certain, if they be long ſuppreſs'd, and a Man take very near his ordinary refection, theſe effects muſt neceſſarily follow, 1. The *Fæces* muſt be intirely percolated, and all the Juices Nutritious, or otherwiſe muſt be Squeez'd out of them into the Lacteals, which is not ſo in perſons, who are in the mean betwixt Conſtipation and Looſeneſs, as Healthful Perſons ordinarily are, and thus one way the Blood may be Augmented thereby. 2. As a Conſequence of this, they muſt extreamly harden, and fill up the Cavity of the Inteſtines, from the Anus to the Duodenum, and by this means, the Pancreatick

Juice, and Bile, muſt Regurgitate, and conſequently the *Ductus Pancreaticus* and *Cholodochus*, be obſtructed, and how much the Blood may Augmented by the Obſtruction of theſe, one may Gueſs from the 148 Prop. *2dia p. Borelli De mot. Animal.* 3. By this hard repletion of the Inteſtines, their Glands (which are exceeding Numerous) muſt be obſtructed, and thereby the Blood Augmented by the Natural Quantity of their Secretion. Thus, from all theſe Conſiderations, it's clear, that the Quantity of the Maſs of the Blood, may in a ſhort time be hugely Augmented by a violent Conſtipation.

FINIS.

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AN
ESSAY
Concerning the
IMPROVEMENTS
OF THE
THEORY of MEDICINE.

THERE are none of the Liberal Arts more neceſſary or uſeful to Mankind than *Medicine*, and yet, by what ill Fate I cannot tell, there is not one of them which is not brought nearer Perfection, than it: The Inſtitutions of the moſt of the reſt, are reckoned neceſſary Qualifications for a *Gentleman*; but few ſtudy *Medicine*, ſave thoſe who deſign to live by the Practiſe thereof. How to account for this, is no eaſie Matter, unleſs we ſay (what is true) that for the moſt part it has been hitherto ſo ſcurvily treated, the Grounds of its Theory, and conſequently of the Practiſe built thereon, made ſo precarious, abſurd, and often contradictory, that Men (no otherwiſe oblig'd thereto) were loth to lay out their Time and Pains on ſuch Uncertainties. They ſaw many Practitioners rather *Empiricks* than *Phyſicians*, who preſcrib'd ſuch Remedies as they read or heard had been ſucceſsful in Caſes which they imagin'd like that of their Patients, but knew nothing either of the Cauſe of the Diſtemper, or of the Reaſon of the Cure.

It is true indeed, it is ſo very hard to obtain any tolerable Knowledge of the Hiſtory of Nature, and of the Springs of Life, of the Vertues of Medicines, and the Texture of the Animal Body; the Manner of the Operation of the former, and the Laws of the Motions of the latter, that this may be one very good Reaſon why Medicine has not not been farther advanc'd. Yet, notwithſtandwithſtanding of all theſe, had the genuine and true Method of obtaining theſe Things been conſtantly and vigorouſly purſu'd, but half the Time of what has paſs'd ſince *Medicine* firſt came to be cultivated, it had made another Appearance than it does at this Day. If Four thouſand Years ago, when Men ſaw the glorious Body of the Sun riſe ſometimes in one Place, and ſometimes in another, and ſet with the like Variety: At one Seaſon juſt peep up, and then down again, at another ſtay a long time with us; in one Place never diſappear, at another never be ſeen for a conſiderable Period; and at a third, ſtay and go at equal Diſtances of Time: When they ſaw the Brightneſs of a Summer's Noon-tide, all of a ſudden, turn'd into the palpable Darkneſs of a Winter's Midnight, without knowing any Reaſon for the ſame: When they ſaw the Moon appear ſometimes in one Figure, ſometimes in another; riſe here to Day, there a few Days after, and a ſhort time after this, no where at all; at one Seaſon all clear, the next Minute all over dark, now ſtand, then go, now before the Sun, then behind him, now near him, then far from him, with a thouſand other Varieties: When they ſaw all the Changes, Viciſſitudes, and various Poſitions of the Planets, the Uncertainties of the Tides, and the numberleſs Number and Order of the fix'd Stars; I ſay, then, when they only ſaw, and knew nothing more about theſe, if any had ſaid that all theſe infinite Varieties might be reduc'd to Rule and Order, that we might come to underſtand the Laws of their Motions, and the Nature of their Orbits, their Poſitions, Appearances, and Diſtances from us, and one another; that we might come to predict their Settings and Riſings, their Stations and Retrogradations, their full and partial Appearances, and their complete and incomplete Diſappearances, and that too almoſt to the greateſt Preciſion we are capable to diſtinguiſh or apprehend. But (which is the utmoſt Perfection of theſe things) if any had ſaid we ſhould at laſt come to underſtand the Reaſon and Cauſe of theſe various Motions and Appearances, he wou'd have ſcarcely been believ'd. And yet we know all theſe things have come to paſs in our

Days, and that, only by purſuing a true Method, every one improving upon the Obſervation of his Predeceſſor, till all the *Phænomena* were compleatly gathered, and then applying the Science of Quantity, (*i. e.* Geometry and Numbers) to inveſtigate their Orbits, their Diſtances, the Laws of their Motions, their Natures, and their Cauſes; by ſuch Means as theſe, Men have brought *Aſtronomy* almoſt to the higheſt Pinacle of Perfection. Now if *Medicine* had been thus treated (as it ought to have been) but half the Time which has paſs'd, ſince it came firſt to be cultivated, I can boldly affirm, if it had not been brought to Certainty and Demonſtration, yet it had been above the Contempt and Reproaches which are now daily thrown upon it, and had not been the common Theme of the loweſt Pretenders to Satyr and Wit.

Whatever be the Principle of Perception in Human, or of Senſation in Brute Animals, yet it is allow'd by all Sects of *Philoſophers* and *Phyſicians*, that all the Diſtempers and Diſorders of the Body of both, are owing to a Vitiation of the Quantity, Quality, or Motion of the Fluids, or to a bad Diſpoſition and Texture, a Diſtortion, Diſtention, Luxation, or Dilaceration of their Conduits, and the other ſolid Parts of their Bodies; and that Medicines operate by the Application and Mixtion of their Juices, or by a Communication of their Virtues to theſe. And ſeeing all theſe are the Modifications and Qualities of material Beings, which have the Dimenſions of Bodies, and are therefore *Quanta*, it neceſſarily follows, that the only Method of examining the Effects and Cauſes of theſe Qualities, is by applying to them the Doctrine of Quantity, *i. e.* Geometry and Numbers; and it is altogether unaccountable, how the World has not been ſufficiently aware of this till within theſe few Years.

The Ancients indeed have given us many Noble Remedies for ſeveral Diſtempers, many ſound Advices about the Management of the Patient, and for the Diſcovery of the Names (not the Natures) of the moſt of Diſeaſes, by telling us what Antecedents, Conſequents, and Concomitants were affix'd to ſuch a Diſtemper, which they call'd by ſuch a Name. In a word, they have done tolerably as to the Practical Part; tho', after all, many of their Receipts and Remedies ſeem very little to us now: For ſuch is the Intemperance, Indiſcretion and Lewdneſs (to which, either Perſonal or Tranſmitted, I wou'd aſcribe many of our Maladies) of our Days, that we are in compleat Poſſeſſion of all their Diſeaſes, heighten'd by as many Degrees of Malignity as there are Years betwixt us and them; and in the mean time we have begotten an infinite Variety of plaguy new ones, againſt which, moſt of their Remedies wou'd have leſs force, than the Children of our Age againſt the Giants of theirs. However, Practiſe was the only part of Medicine they can be ſaid to have any whit improven. For *Theory*: As their Philoſophy was not tolerable, ſo their Anatomy was little better, and their Natural Hiſtory worſt of all, inſomuch that they were almoſt deſtitute of the neceſſary *Præcognita* thereto. It is true, they all requir'd, in a Student of Medicine, a Knowledge in Geometry and Numbers; and thought it indiſpenſably neceſſary, to any one who ſhou'd offer to diſpence a Drugg, adjuſt a Compoſition, or give an Account of the Manner of the Operation of Medicaments; yea, ſometimes we have a few Hints of the Application of theſe in ſome Caſes: Yet, it cannot be deny'd, they made leſs Uſe of it than they might and ſhou'd have done, to the great Detriment of Medicine, as it is a *Science.* An evident Inſtance of this, is the Circulation of the Blood, which, if they had but very little conſidered the Laws of Motion, and the Elements of Geometry, they cou'd not have been ignorant of, as certainly all that are not bigotted muſt acknowledge they were.

Thoſe betwixt the Ancients and them of theſe two laſt Centuries, treated Medicine as all other Sciences were then uſed: They tranſlated, commented, and borrowed from the Ancients, and one another, made a great Pother about Words, and Tropes, and Metaphors, but, for the moſt part, left the Science in no better State than they found it. It is true, there have been ſome great Men, in all Ages, who have managed their Provinces with Skill and Addreſs: But it is certain, that Part of Medicine we are now enquiring into, receiv'd ceiv'd but few Improvements in thoſe Days.

After the Time of the Reſtauration of Letters, *Medicine* advanc'd proportionally with other Sciences; Anatomy was enquir'd into with good Succeſs by ſome, the Hiſtory of Nature, Philoſophy, and Chymy, by others; ſo that, e're this time, the Theorick Part of *Medicine* had arriv'd to a conſiderable Perfection, had not theſe two laſt, miſapply'd, ſtep'd in to hinder the ſame.

The *Philoſophick Phyſicians* were ſo fond of their Syſtems, that every Medical Appearance muſt do them Homage: All was reſolv'd into ſubſtantial Forms, Sympathies, and Antipathies, *&c.* or into ſubtile Æther, Congruities, and Incongruities, *&c.* wou'd they, nill'd they, not conſidering that the firſt of theſe is meer Metaphor, *i. e.* in the preſent Caſe, Words without a diſtinct Meaning, and that the ſecond is plain Nonſence, unleſs theſe things naturally follow from the determin'd Laws of Motion; and, in a word, that all Natural Philoſophy, unleſs ſupported by Geometry, is but a pleaſant *Romance.*

The *Chymical Phyſicians* were yet more wild to introduce their *Laboratories* into the Bodies of Animals, and to expect the ſame Effects from our Veſſels as from their Retorts. Some of them have reſolv'd the Cauſes of all Diſeaſes into Acids, and therefore they muſt be cured by Alcalious Remedies: Others, by an oppoſite Extreme, have reſolv'd Diſeaſes into theſe, and therefore they muſt be cur'd by thoſe. They have made a great Noiſe with their Fermentations, Effervescences, and the like; while, in the mean time, we are certain that neither the one nor the other is in the right, and that the Heat of our Bodies is no wiſe able to produce the ſame Effects with their Furnaces, neither are we able to mix three or four different Liquors in a fine Glaſs Tube, much leſs can we expect ſuch Effects as they aſcribe to their Fermentations from the much more ſlender Canals of Animal Bodies. I ſhall not offer at a formal Confutation of theſe different Ætiologiſts, the Matter has been done, or will be done, by much better Pens; but this in the General I may ſay, That allowing theſe Gentlemen all they crave, yet ſtill all is Nonſenſe, unleſs they firſt ſhew their Syſtems and Chymical Effects to be neceſſary Corollaries from the known Laws of Motion, *i. e.* unleſs all their Philoſophy, and Chymiſtry too, be firſt mechanically explain'd, which moſt of theſe Gentlemen do not pretend to.

Gallileo, *Torricelli*, and *Paſchal*, the the firſt by Water, the other by Mercury, and the third from the Effects of one and the ſame Experiment, at different Heights, brought to light theſe three grand Properties of the Air, (that Fluid which is ſo abſolutely neceſſary, and ſo univerſally uſeful, both to the Being and Operations of Animals and Vegetables) to wit, its Elaſticity, Gravity, and circumambient Preſſure, which have ſerv'd in great ſtead toward the Mechanical Explication of the Animal Oeconomy. *Snellius* firſt found out the true Meaſure of the Refractions of Light, which ſerves to explain the Phænomena of Viſion: And ſeveral have ſhewn the Analogy betwixt the Motions of Muſical Organs, and their Effects on the ambient Fluid, and the Vibrations of a Pendulum, whereby the Diverſities of

Sound, and the Manner of Hearing, are explain'd.

Des Cartes, by a bold (not to ſay impious) Attempt, was the firſt (ſince *Prometheus* and *Democritus*'s days) who endeavoured to create an Animal, *Magnis tamen excidit auſis*. But to be juſt to him, he was no mean Perſon; for, not to ſpeak of the Analytical and Geeometrical Improvements, which are acknowledg'd to be his (ſuch are the Solution of Biquadratick Æquations, the Analytical Inveſtigation of all *Loca*, the Expreſſion of the Natures of Curves by Æquations, which renders them ſo manageable; The Geometrical Conſtruction of Æquations of all degrees, the Determination of the Curves of Reflexion and Refraction (which had perfected Optical Machines as to the Theory, had not a wonderful Property of Light ſince diſcovered, come croſs to it) the manner of the Inveſtigation of which Three, the greateſt Men of this, or any other Age, have lately thought it worth their pains to ſhew: But above all, the Invention of a Method of Tangents, which was unknown to the World before; and how comprehenſive the ſame Method is, *Hudde*,

Hudde, and *L'Hoſpital*, have ſhewn, I ſay, beſide all theſe) it was he who firſt baniſh'd effectually the *Ariſtotelian* Jargon, and made men reflect upon the natural right they had to a Freedom of Thinking: And tho' for the moſt part he did ſubſtitute a bad Syſtem in its room, yet it was ſuch an one as made men reflect more upon the Neceſſity of applying Geometry to Natural Philoſophy; but which is moſt for our preſent Purpoſe, he was the firſt who explain'd Mechanically, the Nature of Viſion, and the Conſtruction of the Eye: He has likewiſe giv'n ſeveral conſiderable Hints towards the better Underſtanding of the nature of Sound, how it acts on our Organs, and raiſes the ſeveral Paſſions, both in his other Works, and in his *Compendium* of Muſick; and tho this laſt Treatiſe be unlick'd and unſhap'd, and never deſign'd for the Publick, as himſelf ſays, yet it has ſome few uncommon Touches not unworthy its Author.

But all hitherto done, was only pickering, or rather ſtorming the Outworks of *Theory* of *Medicine*; the Fort was ſafe and intire, till the Noble *Harvey* gave it a fatal Shock in the Diſcovery of the *Circulation* of the *Blood*; a Diſcovery ſo wonderful, uſeful and happy, that all Ages will admire and bleſs its Author; a Diſcovery ſo conform to the Rules of Mechaniſm, and the Laws of Motion, and ſo fitted to that Geometry, the wiſe Director of Nature uſes in all his Wonderful Works; in a word, a Diſcovery, which has let in more Light into the *Theory* of *Medicine*, than almoſt all the former join'd together.

About this time, *Steno* endeavoured to give an Account of the true Structure of uncompounded *Muſcles*, and to explain mechanically, the manner of their Operation: And tho' he was miſtaken in both, yet by this Attempt, he reduc'd the Choices behind into a leſſer Number, and encreas'd mens Deſires to ſearch into the true Mechaniſm of theſe Wonders of Nature. He likewiſe publiſh'd a Treatiſe, *De Solido intra Solidum*, wherein, beſides ſeveral uſeful things in Natural Philoſophy, there are ſome which have been ſince happily apply'd to that Part of *Medicine* we are now enquiring into.

Sanctorius likewiſe, in his admirable Treatiſe of *Statical Medicine*, has obliged the World with many excellent Rules of Health, and many uſeful Obſervations of the Quantities and Proportions of the ſeveral Natural *Evacuations*, and the Effects of the Suppreſſions of theſe, whereby men are enabled to talk more diſtinctly, and not left to gueſs at random about ſuch things. It is to him likewiſe, we owe the Invention of what is now call'd the *Thermometer*, whereby we are not only enabled to diſtinguiſh the ſeveral Degrees of Heat and Cold, to a much greater Exactneſs than formerly, by our bare Senſes, but likewiſe to prognoſticate ſomething about the Changes of the Weather; but which is moſt of all, we are thereby enabled to underſtand ſomething more than formerly, about the Cauſe of the unnatural Aſcent of the nutricious Juices in Plants and Vegetables.

At laſt came out that ſurprizing Piece of *Borelli*'s *De Motu Animalium*, giving the true Mechaniſm of the external Motions of Animals, and forward Advances in that of the internal Motions: For him was reſerv'd the great Honour of augmenting the Number of Sciences by one; one, the nobleſt and moſt admirable that ever Humane Wit invented! For, by a vaſt Skill in Mechanicks, and a wonderful happy Subtilty of Genius, he not only invented, but himſelf alone, almoſt perfected that Science; a piece of good Fortune, which ſeldom ever happened to one and the ſame Perſon. His firſt Part of the external Motions is perfectly charming, inſomuch, that nothing fuller and more compleat can be deſir'd on the Head. It is true, the moſt Ingenious *John Bernoulli*, the worthy Profeſſor of Mathematicks at *Groningen*, (from a Property of Fluids, and a Method of Inveſtigation, which was not known to *Borelli*) has giv'n the Grounds of a much exacter Calculation of the Elevation of the *Pondera* from their giv'n Reſiſtances, and the Dilatations of the *Machinulæ* which conſtitute the diſtractile *Fibres* of the *Muſcles*, than *Borelli's*, in the 98th Propoſition of his firſt Part; and has likewiſe drawn many ingenious Corollaries from that Speculation, determining the Curve theſe *Machinulæ* would deſcribe, by a Section through their Direction, and the Proportions of the *Liquidum Nervorum*, or, as he calls it, the *Aura motiva* to the

Pondera elevanda. But it muſt be granted, *Borelli* has made the beſt uſe of all the Geometry known in his Days, of any who went before him. In his ſecond Part, he has many admirable Propoſitions for calculating the Force of the Heart, and the *Impetus* which the Arterial Blood receives from it, the determining the Neceſſity of its giv'n Structure, the manner, nature, and uſe of Reſpiration; beſides many uſeful Hints for the Diſcovery of the Motions and Natures of the Fluids of the Body. But it muſt be confeſs'd, this Part is not near ſo compleat as the other: Some of the Motions of the Fluids, and the Natures of the Canals, were things not manageable by his Geometry; and he neither had ſo perfect a Skill in the *Practical* Part of *Medicine*, nor was Anatomy ſo fully diſcover'd as now, to compleat that Part.

His noble Diſciple *Bellini*, has taken up the Science where he left it. He, by an exact Skill in Anatomy, a perfect Knowledge in the *Practial* Part of *Medicine*, a nice and true Obſervation of the leſs common Effects of Nature, and a good Underſtanding in the Mechanical

Philoſophy, has much improven that Part of the internal Motions of Animals: He has nicely diſtinguiſh'd the Natures and Differences of Urines and Pulſes: He has juſtly explain'd the Effects of Blood-letting in ſeveral ingenious Propoſitions: He has handled the general Cauſes and Diſtinctions of Fevers; the manner of the Operation of ſome Medicaments, the Diſeaſes of the Head and Breaſt, after a manner no leſs uncommon than genuine; whereby he has put a quite new, but natural Face on Medicine, and reduc'd it pretty near to a Science, which was before but a Trade. There are ſeveral uſeful and ingenious Propoſitions in his late Book, about the Motion of the Heart, the Blood, and the other Fluids; the manner how to diſcover the Tendency of the Fluid from the Figure of the Canal giv'n, a Confutation of the *Chymical* Fermentations in Secretion, and an Illuſtration of his former Treatiſe about Blood-letting. But, in my Opinion, the nobleſt and moſt admirably uſeful Part of his whole Works, is that about the true Structure of the *Glands*, and his Hints about the Laws and Manner of Secretion. It is a great Pity, that he has not, or will not, explain this more fully himſelf; for I reckon it, and the *Circulation* of the Blood, to be the Key, whereby the *Geometria recondita* will have Admittance into, and let in an *Ocean* of Light to theſe dark internal Regions.

Our Countryman, Doctor *Pitcairne*, has admirably illuſtrated this Part, ſo far as the Labour of conſtant Teaching in one Place, or the Hurry of a toilſome Practiſe in another cou'd allow. He has demonſtrated the genuine Nature of the *Circulation* of the Blood, by ſhewing the Neceſſity of the Continuity of the Veins to the Arteries: He has ſhewn the Mechanical Structure of the Lungs, and thence, the neceſſary Effects of Reſpiration: He has aſſign'd the Organs, their Force and Nature, and the true manner of Digeſtion, and freed us from the Fury of a corroding *Menſtruum:* He has demonſtrated the Neceſſity of Obſtructions rather happening in the Arteries than in the Nerves, and in the Nerves rather than Veins; and how theſe Obſtructions are produc'd: He has demonſtrated the Evacuations proper in

Fevers, and the Cauſe and Nature of the Diſeaſes of the Eye: He has baniſh'd effectually the plauſible Congruity of Pores in Secretion, the ridiculous Cant of Acids and Alcali's, and the whimſical Fancy of Ferments; beſides many other noble Hints, which his manly *Laconick* Eloquence has left undetail'd to the Sagacity of the attentive Reader.

Beſides all theſe, ſeveral Gentlemen of the *Royal Society* at *London*, (which did caſt the firſt Copy to the reſt of *Europe*) and of the *Royal Academy* of Sciences in *France*, and of ſeveral other Philoſophick Societies, have diſcover'd many uſeful Theorems, and made many Noble Experiments, toward the Illuſtration of the Mechanical *Theory* of *Medicine*, which are never ſufficiently to be admir'd or commended.

Theſe are the Men, and this is a ſhort Account of what they have done, ſo far as I know or remember, toward the *Theoretick* Part (at leaſt, toward what I think deſerves that Name) of Medicine. A great many Noble Things this way they have done, and many conſiderable Difficulties they have overcome: But it can not be deny'd, there ſtill remains an ample Field for the Induſtry of the preſent and future Ages. It wou'd ſuppoſe, that one knoweth (which God knows I do not) all that has been hitherto diſcover'd, and that he were almoſt able to ſupply the Remainder, to give a Particular Account of what is wanting in this Part: However, I ſhall venture to give my Opinion of ſome things which are evidently deficient.

I. Tho' I think the greater, and more eaſily conſpicuous Organs and Parts of Animals and Vegetables, be entirely diſcover'd by the Induſtry of ingenious Anatomiſts of our *Iſland*, and thoſe of other Countreys; yet I think we have not, as yet, ſo compleat an Inſpection into the more minute and leſs obvious Parts of theſe, which muſt be abſolutely neceſſary toward a compleat Theory of Medicine: We have not, as yet, trac'd the Continuation of the Arteries, Veins, and Nerves, ſo far as they go, nor ſo far as I hope they may be trac'd: We have not, as yet, a perfect Diſcovery of the Texture of the Brain in all its Parts: We have not, as yet, been able to evolve the compounding

Veſſels of any more Glands, than the Inteſtines and *Teſticuli*: We want the true Texture of the *Liver*, *Pancreas*, *Spleen*, *Kidneys*, and all the other Conglobolous and Conglomerate Glands: We have not diſcover'd the Texture and Range of the Veſſels under the *Cuticula.* But which is worſt of all, we have not, as yet, determin'd the true Situation, nor Poſition, the Windings and Branchings, the Angles they make with one another, or the Curves they deſcribe, of moſt of the known and viſible Canals, which might be eaſily done. The Anatomy of Human Bodies, is as yet very imperfect, and our *Comparative Anatomy* is quite lame: Beſides, a Thouſand other Things which might be here added, which are neceſſary to a true Theory; for unleſs our Theories and Obſervations confirm one another, they ſhall be ſtill little more than the moſt probable Conjectures. The Performances of *Malpighius*, Dr. *Grew*, *Lewenhoeck*, and others, as to this deficient Part, are very well; but ſtill there are here many things deſirable, which I hope are reſerv'd for ſome of theſe, or others, endu'd with a dextrous

Hand, a quick Sight and Obſervation, aſſiſted with fine Microſcopes, and a good Skill, both in the common and more abſtruſe Geometry.

II. We evidently want a Compleat *Hiſtory* of *Nature*; *i. e.* The Names and Natures, the Diſtinctions and Properties, of the Animal, Vegetable, and Mineral Kingdoms. It is true, much has been done already, and ſtill is a doing, this way, by the Noble Members of Philoſophick Societies, and other Private Perſons; yet ſtill very much is wanting. And till that Part of it, which is neceſſary in Medicine, (and how far that may extend none can tell) be perfected, we cannot expect a Compleat Theory thereof: For all know how uſeful, a perfect Skill in the Nature and Virtues of the Remedies, is, to the full underſtanding the Diſeaſe, and the manner of its Cure.

III. We want a Compleat Syſtem of Mechanick Philoſophy, *i. e.* an Account of all the viſible Effects of Nature upon Geometrick Principles; for it is not Syſtems, as they are an Explication of all the Effects of Nature from the ſame Principles which are ſo juſtly ridicul'd, but Syſtems, as they are ungeometrical. It is true indeed, all the great, viſible, conſtant and uniform *Phenomena* of Nature, have been attempted by the Eminent Mathematicians of this and the laſt Age, but accounted for, from rigorous Geometry, by that ſtupendiouſly Great Man, Mr. *Newton*, *Quem ſecula nulla tacebunt:* He has not only giv'n the true Cauſes of theſe *Grand Appearances*, the Laws of Motion, and the Nature of Fluids, the Nature of Light and Sound, the Manner and Rules of their Propagation; in a word, all the general Mathematical Principles, whereby to examine the Pretenſions of different Syſtems, and many new ſurprizing Problems and Theorems in the ſpeculative Part of Geometry; but he has likewiſe diſcover'd the true Principle of all the Effects of Nature, to wit, Attraction, or Gravitation: But, which is moſt of all, to him we owe the only Key, whereby the Secrets of Nature are unlock'd, to wit, the general Way of managing Æquations, the Methods of *Infinite Series's*, and of *Fluxions*, direct and inverſe; Examples of which, his whole *Principia* are. This is that which will bring *Analyticks*, *Geometry*, *Natural Philoſophy*, and the *Theory of Medicine*, to their utmoſt Perfection, if ever they get thither: By theſe we are able to contract all the Myſteries of the Ancient and Modern Geometers into the room of a few Lines, and diſcloſe them with a few Scrapes of our Pens; of which, when People ſee the Concluſions, without knowing theſe Methods, they look like Conjuring, or ſomething above the Capacity of Men. Yet, after all, theſe Methods have not as yet been apply'd to the leſſer, leſs obvious, leſs conſtant, and leſs uniform Effects of Nature, of which we are principally ſpeaking here, and which are ſo abſolutely neceſſary to a true Theory of Medicine: And tho' I am perſwaded, that from the ſame Principles the grand Appearances of Nature have been accounted for, theſe more minute ones may be ſo too; yet it is what has not been actually done, and without which we ſhall be ſtill ſtraitned in our Theories. We want to know the Mechanical Account of Chymical Operations, and Preparations of ſeveral ſorts; which is a vaſt Defect: We want to know ſomething more about the Nature of Fluidity, and what it is makes up the many Varieties and Differences of Fluids from one another; the Figures of their conſtituent Particles, and a compleat Collection of the Laws of their Motions: We want to know the true and adæquate Nature and Cauſe of Heat and Cold, and the Reaſon of their odd Effects: We know not the Figures of the Particles of Bodies which produce ſuch Varieties of Taſtes: We want to know the Figures of the Particles of Bodies which naturally form themſelves into ſuch and ſuch Shapes, after the manner *Hugens* has analys'd Iſland Cryſtal; this wou'd be of mighty uſe toward the full underſtanding of the Natures of all Saline Bodies, which generally form themſelves into determin'd Figures: We do not, as yet, underſtand the Principles of *Individuation* (if I may ſo call it) of one kind of Body from another; Why ſome have ſuch Grains, Colours, and Shapes, others different: We know not the true Nature and Cauſe of *Elaſticity*, which is of ſo great Extent in the Animal Oeconomy: We want to know a great deal more about

Light and Colours, Opacity and Tranſparency, tho' we hope to receive Satisfaction therein ſhortly from that Great Perſon who has ſo dearly obliged the World already. Theſe, and a Thouſand other Things, we want, which he only can enumerate, who cou'd ſupply them: And tho' we have many and noble Hints in moſt of theſe, from *Borelli*, Mr. *Newton*, and ſome other Mathematicians, yet we have not ſo perfect a Knowledge of them as might be deſir'd, and, as I hope, may ſome Day or other be obtain'd.

IV. Laſtly, We want a *Principia Medicinæ Theoreticæ Mathematicæ:* Albeit the Theory of Medicine and Natural Phyloſophy be nearly ally'd, and tho' the lately mention'd Great Man has almoſt compleated the latter, yet he did it not with that View to be mainly ſubſervient to the former: And tho' *Borelli*, in his excellent Book, *De vi Percuſſionis, & de Motu Natur. a Gravitate factis*, has demonſtrated ſeveral things uſeful to that Purpoſe, yet he concern'd himſelf mainly, but with thoſe things which he thought neceſſary to the underſtanding of his Book, *De Motu Animalium:* So that, notwithſtanding of both theſe, we have not ſuch a Book as I reckon this ſhou'd be. Such a Book (among many other things which I am not capable to enumerate) ſhou'd at leaſt contain theſe things: 1. It ſhou'd contain the true Nature of Fluidity, wherein it conſiſts, and what it is that makes one Fluid differ from another, the Figures of their conſtituent Particles, and why there are Solids of ſuch and ſuch determin'd Shapes naturally generated in each particular Fluid; the general Laws of the Motions of all Fluids, and the particular ones of each different kind, whether homogeneous and uniform, or a Mixture of ſeveral different kinds. 2. It ſhou'd contain the Nature and Cauſe of Elaſticity, and the Figure of the conſtituent Particles of Elaſtick Bodies, and the Laws of the Percuſſions and Reflexions of ſuch; the Curve, into which Elaſtick Bodies naturally form themſelves, when bended, if they obſerve one conſtant Law, *i. e.* if the Tenſion be always proportional to the bending Force; or the ſeveral Curves they muſt deſcribe, if different Elaſtick Bodies obſerve different Proportions, (as *James Bernoulli* has done) which wou'd be infinitely uſeful in the Theory of Medicine. 3. Since it is certain now, that Glands are nothing but a Complication and Circumvolution of the Arteries into Curves of ſuch and ſuch Natures and Numbers, or into *Plicæ*, whoſe Turnings are Curves, or make right-lin'd Angles of ſuch and ſuch Quantities: Such a Book ought to determine the Effects ariſing in the Fluids, as to the Acceleration or Retardation of their Motion, their Viſcidity or Fluidity, the Comminution or Augmentation of their Conſtituent Particles, when mov'd in Canals turn'd and complicated into all poſſible curve or right-lin'd Figures; and what Effects wou'd ariſe in the curv'd Canals themſelves, as to their Elaſticity or Diſtractility, in being turn'd into ſuch and ſuch Curves. I imagine it is ſome ſuch thing as this, which *Guilelmini* promiſes in the Preface of his Treatiſe, *De Aquarum fluentium menſura*; for we know the Laws of the Motions of Fluids in direct Canals, already. This wou'd be a Work of vaſt Labour, but of noble Uſe; and we know not but general Methods might be fall'n upon to alleviate the Labour of the Calculations. Mr. *Newton* has giv'n one Theorem in two Lines, which, if rightly manag'd, will give the Quadratures, Rectifications, Surfaces, Solidities, Centres of Gravity and Percuſſion, or Oſcillation of all-imaginable Curves and Solids, whoſe Natures can be expreſs'd by any Analytical Æquation whatſoever. I know of ſomething like the ſame done for all Curves and Solids, whoſe Natures are expreſs'd by Tranſcendent or Exponential Æquations, *i. e.* ſuch as he calls *Geometricè Irrationales*: And perhaps both theſe laſt may be compounded into one, and conſequently comprehend the firſt likewiſe. Now if ſuch general Methods were fallen upon, for theſe which we are ſpeaking of, it wou'd ſave a great deal of Calculation, Reading, and Writing; and why it may not, I ſee no Reaſon to doubt. 4. It ought to contain a Calculation or Determination of what Effects the Fluids wou'd have upon one another, and upon Canals form'd into ſuch Curves, upon an Augmentation or Diminution of their Quantities, an Acceleration or Retardation of their

Motions; the Encreaſe or Diminution of their ſpecifick Gravities, or of the Bulk and Figure of their conſtituent Particles, or the Alteration of their Fluidities or Viſcidities. 5. It ſhou'd contain what Effects ſolid Particles of all Figures, Sizes, and different Gravities, mixt with Fluids of all kinds, wou'd have upon the Fluids themſelves, or upon the diſtractile Canals of ſuch and ſuch Figures. 6. Laſtly, it ought to contain the final Cauſes, and the Mechanical Neceſſity of the giv'n Figures of the more ſolid parts of the Body; Why ſome Glands are Conglobous, others Conglomerate, as they are call'd; Why the Teſticles reſemble a Spheroid, generated by the circumvolution of a Semi-ellipſis about its longeſt Axis; and the Heart, one generated by the circumvolution of a Semi-ellipſis about a Diameter oblique to its longeſt Axis, or at an Angle of 45 Degrees with the ſame. Why the Muſcles, ſome of them are of one Figure and Texture, ſome of them of another; ſome ſituate near the part to be mov'd, others at a greater diſtance from it. Now, tho' many of theſe things here mention'd, are to be found already accounted for, and demonſtrated in the Writings of the Geometers of this Age: Yet one who profeſſedly deſign'd to treat of theſe things for the benefit of Medicine, ſhou'd either Tranſcribe them out of theſe, or Demonſtrate them anew after his own Method, that we might have all that belongs to this Subject together in one Book.

But after all, perhaps it may be ſaid, ſuch a Chimerical Piece as this, toward which there are requir'd ſo many hard (not to ſay impoſſible) things, will never be written by all the Wit of Men. To this, I anſwer, That there are very great Advances toward ſuch a Piece already made, and if a few ingenious Men, endowed with a perfect skill in the Abſtract Geometry, and the new Methods of Inveſtigation, ſhou'd but manage this Province after the manner we formerly ſhew'd Aſtronomy had been treated, each improving the Diſcoveries of the other, the one beginning where the other had left off; I doubt not but theſe I have mention'd, and harder things too, might be brought to paſs: And if once ſuch a Book as this was finiſh'd, and the other neceſſary perquiſites ſearch'd into, Medicine in a ſhort time might be brought to the immediate Confines of Demonſtration.

There are two things, which wou'd mightily conduce toward the perfecting ſuch a Work as this of the *Principia Medicinæ Mathematica.* The firſt is, the publiſhing ſomething concerning the *Inverſe Method of Fluxions*, or as the *French* call it, *La Methode de Calcul integral*; which might contain the Application thereof to all the intricate Problems of Geometry, and give general Canons for the Solution of all ſuch, and likewiſe general Precepts for the Application of the ſame to Mechanick and Natural Philoſophy, with the Illuſtration of them by many particular Examples from Mr. *Newton*'s *Principia*, and the Noble Problems ſolv'd within theſe Dozen Years, and Publiſh'd in the *Philoſophick Tranſactions*, *Acta Lypſiæ*, and *Journal's des Scavans.* For tho' a man with a great deal of pains, may gather the Materials of ſuch a Book, from ſcraps here and there, yet there are few who have ſo much leiſure, or if they have, will give themſelves the trouble; or if they cou'd do both, have the convenience of ſearching into ſo many different Books, to gather up what is neceſſary to furniſh them with a tolerable knowledge of this wonderful Method: And therefore it would be of great Uſe to the World, and to the Improvement of Learning in general, That a Book, containing at leaſt all that is already publiſh'd on this Head, were compil'd and ſet in a clear Order. It is true, the Noble *Leibnitius* has promis'd ſuch a Book as this, but I am afraid his great Employment will deprive us too long of that Advantage: Beſides, I doubt he will not condeſcend to the Capacity of the lower rank of Geometers, for which ſuch a Book ſhou'd be principally deſign'd. *Carre* indeed has giv'n the firſt Rudiments of ſuch a Work, but he is ſo far from giving an Account of all that is publiſh'd this way already, that I am afraid he has not underſtood them himſelf, his Performances on that Head being ſo very low. A Second thing, which wou'd very much conduce toward the Work we were ſpeaking of, is, that the great Geometers of this preſent Age wou'd be pleas'd to publiſh thoſe many noble Secrets of Geometry and Philoſophy, which, to the great Detriment of Learning, they think fit to conceal; what Reaſons they have for doing ſo, they know beſt themſelves, but I am ſure it wou'd be a greater Honour done to themſelves, and a greater Advantage to the Age they live in, and in particular to the Mathematicks, to communicate to the publick, ſuch things as they know have not as yet been made common, than to keep up the Method, now in Vogue among ſome, of propoſing hard Problems, (which are at leaſt ſuppos'd, known by the propoſers,) to employ the time of others, which might be laid out on things as yet unknown: This wou'd put an end to the Contentions about the Honour of Inventions, and prevent the melancholly Diſappointment ariſing from finding out excellent things, and yet not to be reckon'd the Inventors of them. There could be no greater Encouragement for an ingenious man, than to be ſure he ſhould not beſtow his time in vain, if he were ſucceſsful in his Deſign; that is, to be ſure he is not already prevented.

Thus I have frankly given my haſty Thoughts, about things of very great importance: But I hope the candid Reader will more eaſily Pardon the many Eſcapes of this rude Draught of an Eſſay, for theſe reaſons. Firſt, that it was written in a Place deſtitute of all common Aſſiſtances and that I could be at no eaſe till it was done, the Bookſeller preſſing to have it without any Delay: And in the next place, that if ever I ſhall be betray'd into Publiſhing any thing again, it ſhall be on a Subject leſs obnoxious to wrangle, and where there is a ſurer guide than *Imagination*. For to deal freely with the Reader, it was out of meer Indignation that I put Pen to Paper on this Subject, having ſeen it ſo unskilfully manag'd by two of our own Phyſicians here in Town, who ſome time ago Play'd at *Loggerheads*, about Vomiting in Feavers. I owe them thanks, for the many good words, and a few good offices they have ineffectually endeavour'd to do for him whom they ſuſpected to be the Author (how far their kindneſs would have extended it ſelf toward him who's the Author, indeed had they known him, we may eaſily gueſs); however, all that I ſhall ſay of them, is, that the one (that Enemy to all Schemes, Figures, Senſe, and Demonſtrations) had a bad Cauſe, and defended it moſt wretchedly: And that the other, having imitated the practice of better Phyſicians, was not ſo happy as to Imitate their Reaſoning, but ſpoil'd a good cauſe by bad Arguments.

FINIS.

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